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MARCH 1986

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DATA STATEMENTS



Amidst the guns, wild

Scot in The Hood

THERE'S A VERITABLE EPIDEMIC OF NEW software in the shops at the moment, so let's go on with the news straight away.

Remember the *Mammoth* AmigaSofts does. The latest game from this prolific software house is called *Wild West* and has all the traditional features of a classic John Wayne movie. Big Name Bill and his boys have captured Fort Snake and you're the hero who has to liberate this outpost. On your quest you'll encounter such well-tried western hazards as a lone soldier, a shoot-out with the sheriff and a wild stagecoach ride. It's for the C64 and is available on cassette (\$9.95) or disk (\$12.95).

If you'd prefer something a little more cultural, why not take a look at Global Software's *Old Scores*. It's an adventure set around London's South Bank, its temples and lakes. The *Blue Walls* (one of Masson's little gems). There's also a coacher in each game which enables the purchaser to a free guided tour backstage at the Royal Festival Hall.

Now on to a different track with the computer version of *Scalextric* from Leisure Genius. Produced under license from Hornby, Hobbes the game incorporates many of the features of the popular hobbyist sets. You can design your own tracks using straight, curves and chicanes and each player has a 3D view of the track ahead as well as a plan of the whole

circuit. It's for the C64 and costs £9.95 on cassette.

Interplay has also been looking around the marketplace to find an idea for its latest release. The game is called *Zoids* and is based around Tomy's range of *Zoids*. You'll find yourself as *Reisbar* in the middle of a war between *Blue Zoids* and *Red Zoids*. *Zodrilla*, the blue leader, has been smashed into eight pieces all of which are scattered behind enemy lines. You to the infant warble little *Zoid* who has to go and retrieve them. Look out for *Red Thars*, leaders of the enemy *Reisbar*. *Zoids* costs £9.95 on the C64.

Virgin has brought out a follow up to *New Games* - appropriately called *New Games 2*. This tape contains such popular

titles as Airwolf from Elite Systems, 3D Air Nong from Gargoyle Games, Caudern from Palace Software, Charlie Egg 2 from A&F and World Cup from Artic. You can get the lot for £8.95.

As reviewed in Your Commodore (February 1986), you can now purchase Rainbow's The Magic System. According to Rainbow, there's nothing like it whether you're Heisen 17 or a two-finger-pointer. It's out now on cassette (£14.95) and disk (£17.95).

If you're one of those people who's always talking about life, the universe and everything, then you'll be happy to learn that you can now play The Hitchhiker's guide to the galaxy in the safety of your home, courtesy of Softtel. This is only one of the games in a new range of Intimate Classic Titles. The other four are Jack 1, Secretaries, Planetfall and Deadline. The prices of the games have also been reduced so you can pinch around the Milky Way for a mere £14.95 or try any of the others for only £10.95.

If you enjoyed Emerson Consultants Paradise then you'll be pleased to hear that a sequel is at this moment winging its immortal way to your local shops. Named Unicorn the game is a fast arcade style shoot-em-up. It will be available at the end of February and there's also a plot about to put both games on disk.

US Gold is still producing new titles like there's no tomorrow. And there's good news for C/M and Plus/4 owners. For £7.95 you can now buy yourselves a copy of Beach Head.



Tony Rainbird makes music

Level 9 has added a third title to its Select Dream series - The Worm in Paradise. The two previous games in the trilogy were Snowball and Return to Eden. The Worm costs £9.95 for the C/M.

Put up with playing other people's games? Perhaps Ariston has the answer to your problem. You can now buy Gamemaster; The Computer Game Design Kit. Using a joystick you can select commands from a menu to produce and animate characters, draw backgrounds, create sound effects and compose musical scores. The cassette costs £9.95 and the disk version is £18.95 including a free blank disk to save your games on.

Supersoft has also come up with a helpful program for the creative folk among you. Howcharter is a machine language program which will display or print a Basic program after it has been written. When something goes wrong with your latest program all you need to do is call up a Howcharter and you'll be able to see what your program is doing. It's £12.95 on tape and £14.95 on disk and it's out now.

Mastertronic, the UK budget software house, has launched itself into the business world with a word processing package called Ski Writer. The package was originally released in the USA by Permco but now world rights have been jointly acquired by Mastertronic Limited (UK) and Mastertronic International Inc (USA). It's available on cassette and disk at £12.95 and £14.95 respectively. A special version for the C/M is on the cards and will be released shortly. It is hoped that it will use all the extra capabilities of the C/M.

Each into space we go to look at CRL's latest game, the title of which is probably a

**Ski
Writer**

"The new
standard for
word processing
software"

— *John Ford*



MASTERTRONIC

candidate for the most terrible pair of 1986 - Space Droids. Ironically, the plot features the US Marine, transporting a cargo of food to the hungry soldiers on Planet Hellsboro. Of course you run into trouble but find out more by spending £7.95.

Time to spin off to the foreground and have a look at an offering from Interscope Music. Wild Ride, a new arcade game for the C64, features a CRTED boarder intent on destroying the rollercoaster in an amusement park. Luckily, you - in your alternative persona of a clown - are available to run along the tracks and detonate the boards. If you want to enlarge your life and your coinage, it will cost you \$5.95.

Touch Line

Wild West Aristocrat, Suite 105/6, Apollo House, Palace St, London W1H 9JG. (01 634 8907) Price: £12.95 disk, £19.95 cassette.

Old School Global Software, PO Box 87, London W11 1BS (01 226 1986).

Robotnik Leisure Genics, 1 Montague Row, London W1H 9AN (01 910 4623). Price: £5.95.

Goldfish Mammoth, Martech House, Bay Terrace, Pinnerway Bay, 1 Essex (BX24 6JX) (0203 766496). Price: £9.95.

New Games In Virgin Games, 3-A Ipswich Road, Portsmouth Rd, London W11 2JH (01 722 8870). Price: £9.95.

The Music System Rainbird, Wellington House, Upper St Martin's Lane, London WC2E 9DA. (01 348 8838). Price: £14.95 cassette, £17.95 disk.

Interscope Classics Softell, Burgess and Co., 48 High St, Maidenhead, Berks SL6 1DS (0494 72727). Price: (Hitchhiker's) Guide £24.95, others £18.95.

Urbans Horizon Consultants, 568 Milton Trading Estate, Milton, Abingdon, Oxon (0208 812896).

Touch Music US Gold, Unit 18, The Parkway Industrial Estate, Henegay St, Birmingham, B7 4LY (021 399 0829). Price: £7.95.

The Moon In Paradise Level 9, 322 Hughenden Rd, High Wycombe, Bucks HP13 9PG (0494 2871). Price: £5.95.

Gamesmore Activision, 15 Harley House, Marylebone Rd, London NW1 (01 915 1428). Price: £24.95 disk, £9.95 cassette.

Flowerchildren Supersoft, Winchester House, Goring Rd, Wrexham, Warrim, Merseyside M43 7HA (01 881 1166). Price: £15.95 cassette, £24.95 disk.

Ski Withit Mastermind, Park Lane, 111 Park Rd, London W4A 7JL (01 277 6888). Price: £24.95 disk, £15.95 cassette.

Space Droids CBI, CBI House, 9 Kings Yard, Carpenters Rd, London E15 3AD (01 510 2888). Price: £7.95.

Wild Ride Interscope Music, Union House, The Green, Reddy, Hants (Fadley 2766) (0711). Price: £6.95.

Hard Lines

ARE YOU ONE OF THOSE PEOPLE WITH a Commodore PET tucked away in a cupboard? Now, thanks to Supersoft, it could be in for a new lease of life. The Supersoft RAM PLUS boards allow any machine to be upgraded to a full 128 - the most that Basic will recognise. For £11 the RAM PLUS 16 will upgrade a 16K PET and the RAM PLUS 32 upgrades any large keyboard machine from 8K to 128 also cost £16.

The oldest 8K PET is with calculator style keys and built-in cassette decks are also canned for. They need a special board, the RAM PLUS 165 which is also priced at £66.

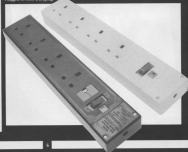
Not satisfied with this, Supersoft has also produced the BASIC 3+4 board which allows any 48 column PET to run both Basic 2 and Basic 4. And, finally, there's the BASIC/UCRM board, a 80M/1P812M emulator with 2K of battery backed up RAM. Both of these are £85.

If you have ever experienced supply problems caused by interference transmitted via the mains supply, then you may be interested in Cordock electrical's Smoothline Connectors.

The unit provides four filtered outlets (each rated at six amperes maximum) from one 15 amp mains socket. It comes complete with a mains lead and plug and is fitted with four miniature plugs for wiring to the computer equipment.

Interference can be caused by other home appliances being switched on or off either manually or automatically. This can result in data being corrupted. According to Cordock, Smoothline is the first serious attempt to eliminate these problems.

Plugged in with Dargag



Dargag Electrical is also trying to minimise your home computing problems with the latest version of colour key socket outlets. The new Dargag range comprises two models: the multi-fused 4155 and the fused 4156. New features include a socket on/off switch, a neon mains on indicator and a removable terminal cover for easy wiring. They cost around £10 and are available from electrical stores.

Teloge is launching back into the C128 hardware market with the Vidcon 1.2 and 1.4 upgrades. The Vidcon 1 allows any monitor or TV to display the 68 colour output of the C128 in any of the 16 available colours. It costs £19.95. The Vidcon 2 (£49.95) is similar but cannot be used with a standard TV and the Vidcon 3 is a monochrome version of Vidcon 1 and costs £29.95.

Robcom - now renamed Robotek - has also started catering for the C128 port. Two new products have recently been launched. The first allows you to use both 48 and 80 columns on a C128 on a normal composite monitor. The second is an event for avid games players. Game Killer turns all game positions so that you can't be killed in any game you play. Both retail at £14.95.

Touch Line

PET Upgrade Boards Supersoft, Winchester House, Goring Rd, Wrexham, Merseyside M43 7HA (01 881 1166).

Smoothline Cordock Electrical, Mochrie Industrial Estate, Newtown, Powys SY16 4LP (0688 27108).

Dargag Electrical Winwood Works, Magpie Rd, Broadstairs, Kent (0401 8677).

Vidcon Teloge, 29 Holmes Lane, Redford, BD4 6QJ, (0274 68926).



Software aid for leukemia patients

Generally Speaking

CITIZEN EUROPE, MANAGERS OF 1988 major printers, have been awarded the C-Mark design award for a new range of MMP printers. The C-Mark is the Japanese equivalent of the British Design Council award.

Citizen Europe also made itself very popular with Ian Botham by donating £200 to the Leukaemia Research Fund, the Secretary of Ian's marathon John O'Grady to Land's End walk.

If you've ever wanted to go to America, perhaps you should go out and buy a copy of QuarkX's (Pleasure's) program - Robin Dobbs Deso. QuarkX is running a competition in conjunction with MMP/MSB and TWA and the prize is two tickets, to Los Angeles, a chance to visit the Hanna-Barbera studios and a trip to (Disneyland).

The game is on sale now at £7.95 and you're eligible for the competition if you buy a copy.

Ultimate has decided to stop going in alone and has handed over control of manufacturing, marketing, promotion and sales of all its products to US Gold.

Ultimate will now be leaving this side of the business alone so that its team can concentrate solely on developing new products.

In Touch

MICROSOFT HAS LAUNCHED A MULTI-user game as a rival to British Telecom's

MSUD. The game is an adventure called StarNet and allows 328 people to play simultaneously. In a space adventure in which you can form alliances and attack your fellow players in an attempt to become the one who finally controls the 3880 stars in the galaxy. Contact Microsoft 780000 for more details.

Msu also helped out on the BBC's Children in Need appeal by holding an online celebrity challenge with the stars at the BBC studios on the night of the Telethon. For a small fee Microsoft members could ask any questions they liked of stars such as Selling Scott, Paul Nicholls and Patrick Moore. Along with the proceeds from an auction of software and hardware Microsoft was able to donate well over £2000.

If you're thinking of buying a modern, perhaps you should take a look at the W3200 modems from Microlife. The company has just cut the price by more than 40%. The modern ones cost £120 instead of £160.00.

Touch Line

Microlife 880, 811 Herby Hill, London EC1R 5J1 tel 278 3140.

Microlife Technology, 14 Peters Is, Ipswich IP1 1BB.

C128 Winners

WE HAD A MARVELLOUS RESPONSE TO our 528 competition, but unfortunately

many people will have to be disappointed as we've only got two computers to give away. We will close the following five people and nominations to the rest.

The winners are: Matthew Seabridge, Acorn, York; D J Cousins, Blackland, Essex; Paul Knowles, Finchley, London; Mark Wallard, Upminster, Essex; William Hicks, Melford, Pwys.

Congratulations

WE'VE BEEN REALLY BUSY MAKING competitors to have a list of the lucky winners, starting with our Modern competition which appeared in our November 1989 issue. The 18 winners are: Philip Costa, Southgate; Marie Sharp, Merton; Dave Parsh, West Wickham; M J Robinson, Nottingham & J Knight, Sleaford; Barry Dent, Haydon; Richard Vase, Whimple; John Philip Temperley, Lancaster; Chris Munro, Boston; David Barlow, Dorset.

In October we ran a Wizard Development competition, and the following 30 people will each receive a copy of Wizard: Andrew Sturt, Maxwell Hill; J Barrett, Solihull; C De Haan, Rotterdam; Rachel Fox, Aberllynfi; D Coombe, Sharnbrook; David Knight, Farnham; H Davies, Leamington Spa; Stuart Brown, Chappenhams; Derek Martin, Ebbw Vale; D Johnson, Southampton; D Chambers, Wellingborough; Richard Lee, Bournemouth; G. Mago F Cross, Farnborough; Scott Birmingham, Slough; Ashley Khan, High Wycombe; Jeff Bask, Schwerdtfisch; W Germany; Basil Kumar Raley, Leeds; C J Marks, Grootegron, Netherlands; JM Fryer, Rotherham; Thomas Hallway, Timothy Davies, Cardiff; D Balcombe, Middlesbrough; Jeremy Smith, Lowestoft; Stephen Darnell, Neasome; A Jackson, Hull; Simon Walter, Kilburn; James Tucker, Maresfield; Peter Pisker, Dulton; Grahame Head, Redhill; Gairn Dobson, Newcastle-on-Tyne, Co. Down.

In December 1989 we ran a US Gold adventure war competition and the following 30 people will each get a set of US Gold adventures: Michael Valachi, Brandon; C W Nelson, T M Croop, D Signal Berg; P T Wheeler, Cawley; David Yellars, Kingham; D A Nutting, Weston-Super-Mare; John Palfrey, Kyrnos; Peter A P Roberts, Neasome; Anthony J Bane, N Y 1000; Jonathan Symonds, Middlesbrough; John Wright, Stoke-on-Trent.

Easy Entry Revised

SOME OF US SEEM TO BE HAVING A PROBLEM with our Easy Entry program. However we've now found a way to solve this, so if you've had difficulty using the program, try adding the following line and it should sort things out for you.

END 4 = FILE (2)

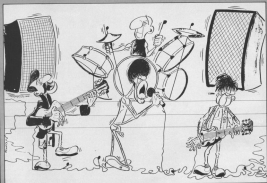
Make your party go with a
swing with our great prize
from Wizard Development.

THIS MONTH WE'VE GOT A PRIZE
which will get your feet tapping and your
hands clapping.

We got together with our friends at
Wizard Development and we can offer a
personal hi-fi to the reader who's first out

of the bag in our really easy competition.

There's a musical theme to it, of
course, but it shouldn't give anyone any
problems, so get your pen out and read
on to find out what to do.



How to Enter

Study the picture on this page. There are
several musical notes hidden in the
cartoon. All you need to do is circle them
clearly and send the entry coupon to us.
Don't forget to complete the telephone
number of your entry will be disqualified.
Please use no more than 15 words.

The Rules

Entries will not be accepted from employ-
ees of Angus Specials Publications
and Wizard Development. This restriction
also applies to employees' families and
agents of the company.

The How to Enter section forms part of
the rules. The editor's decision is final and
no correspondence will be entered into.

WIZARD COMPETITION ENTRY COUPON

Name.....

Address.....

Post code.....

Number of musical notes found

Send your entry to: Wizard Competition, Your Commodore,
1 Golden Square, London W1R 3AB.

Closing date: Monday 31 March 1986.

Write clearly and fully and do not forget to write your answer
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Laskys, Rumbelows, Savacore, Supreme, Ultimate, Vallance, W H Smith & Sons, Wiggins, and all good computer stores.

More music from your
C64 with this superb
program from Tony
Crowther.

IF YOU WOULD LIKE TO become a budding composer or simply get your C64 to play music as good as that in commercial games then Music Master is what you need. In fact I have used this program, and some earlier versions, to enter music into many of my own programs, so that should give you an idea of its versatility.

The main differences between Music Master and many of the other 'Music Editor' programs - available either through magazines or commercially - are that:

1) Music is entered in the form of easy to understand DATA statements.

2) Music to be played is stored in memory as code and a machine code play routine will play the music without interfering with other programs.

You may think that a program which has to read music from DATA statements would be very slow but that's not so. Music Master will read around 288 musical statements per second and set it up in memory ready to be played by the routine mentioned in 2) above. Another important fact to remember is that, once the music has been transferred from DATA statements into memory, you can save the block of music to disk or tape using a machine code routine and you will not have to go through the DATA statements again, but more of this later.

Program Format

As I've already mentioned, all music is entered in the form of DATA statements. The DATA statements are broken into

three sections: Data for Voice one, Data for Voice two and Data for Voice three. Music Master expects to find the music data for each of the C64's available voices at the following lines:

5000 DATA for voice one.
5800 DATA for voice two.
7000 DATA for voice three.

In order that Music Master knows where each voice finishes, each should end with a special number. These are -1, -2, -3 for voices 1, 2 and 3 respectively. When working with Music Master, I usually set up the program as follows so that I don't forget the '-' number. If you do then the program would probably stop working.

5000 DATA, voice 1 data.
4999 DATA-1
5000 DATA, voice 2 data.
4999 DATA-2
7000 DATA, voice 3 data.
6999 DATA-3

NOTE. As in the above illustration you must not put any spaces after the word DATA, if you do then the program will not work properly.

Available Commands

A large number of commands are available with Music Master. Each one will effect certain changes in the SID chip, this is the device that allows your C64 to play music. Normally you would have to POKE values into certain registers of the SID chip but Music Master will do this for you, and do it very quickly. It is therefore possible to change parameters while music is playing. Figure 1 lists the available commands and the registers which they effect.

I will now explain the available commands.

Tempo

'T' is the command used to set the speed at which music is played. After the 'T' there are three digits which indicate the speed, these range from 001 to 255. For example 'T001' would set the tempo to three. There must always be three digits after the 'T'.

The more technical amongst you may be interested to note that a value of 'T001' would cause a note to be played every 1/500th of a second. A speed of 'T002' would therefore cause a note to be played every 1/250th of a second. Memory location 53247 is a fine tune for the speed, it is normally set to 255 but POKEing it with different values will speed the tempo of the music up.

Volume

'V' is used to set the overall volume of the music. This can

music Master

range from 000 to 015. The command +000 sets the volume to maximum. If you were to use numbers greater than 005 then you would start to bring in some of the SID-chip filters. This is because the register which is altered by the command is also used to hold filter information. I'll deal with filters in more detail later.

Waveform

Each voice must have a wave form set for it. The following commands are used to choose the type of wave for each voice:

-0000 - No sound
-0017 - Triangle
-0011 - Sawtooth
-0005 - Pulse
-0001 - Triangle and pulse
-0120 - White Noise

When you are using the pulse waveform then the pulse width must be set. Two commands are used to do this - 'Y' and 'X'. Again three digits must be entered after each number. Use 'Y' to set the high byte of the pulse width and 'X' to set the low byte. The commands have the following ranges:

-Y000 to -Y015 (high byte).
-X000 to -X015 (low byte).

Envelopes

Not only must you set the waveform type for each voice but you must also set the envelope. The envelope is more commonly known as the ADSR or Attack, Decay, Sustain and Release. The command -1000 is used to set the attack and decay while the command -0001 is used to set the sustain and release. These two commands alter the usual bit patterns associated with the ADSR settings. Each of the parameters can have a value between 000 and 15. However since each command operates on two parameters the actual

Command	Limits	Action	Locations Altered
-1	N/A	Marks end of voice 1	N/A
-2	N/A	Marks end of voice 2	N/A
-3	N/A	Marks end of voice 3	N/A
-4	000-255	Set Volume and Filters	54286
-5	000-255	Attack/Decay for each voice	54277 voice 1 54284 voice 2 54291 voice 3
-6		Set waveform for each voice	
	000	No Sound	54276 voice 1
	017	Triangle	54283 voice 2
	011	Sawtooth	54290 voice 3
	005	Pulse	
	001	Pulse/triangle mixed	
	120	White Noise	
-7	000-015	Pulse width High Byte	54275 voice 1 54282 voice 2 54289 voice 3
-8	000-255	Pulse width Low Byte	54274 voice 1 54281 voice 2 54288 voice 3
-9	000-255	Sustain/Release for each voice	54278 voice 1 54285 voice 2 54292 voice 3
-H	000-255	Filter Resonance	54295
-J	000-007	Filter Cut Off Low Byte	54293
-K	000-255	Filter Cut Off High Byte	54294
-T	000-255	Tempo	N/A
-W	1	Oscillator On	54298
	0	Oscillator Off	54299
-X	1	Oscillate Pulse On	54300
	0	Oscillate Pulse Off	54301
-Y		Change wave while playing	
	1	Pulse	
	2	Sawtooth	
	3	Triangle	
	4	White Noise	
	0	Off	

Figure 1

numbers to use are a little complicated to work out.

Firstly you will need to find the corresponding value of a parameter in binary. For example, a setting of 15 would have the binary pattern 1111 and one of nine would have the pattern 1001.

Now let's take a look at the 'Y' command in more detail. If we were to break down the number following the 'Y' into binary then the number would have eight bits (i.e. 11111111). The first four bits represent the Attack and the last four the decay. If we therefore wanted an attack of 15 and a decay of

nine the number would have the following form:

11111001

Now we can convert this number to decimal as each 1 has an equivalent decimal number depending on its position. This involves adding these numbers up to find the number that has to follow the 'Y'. Each position has the following value:

ATTACK	DECAY
128 64 32 16	8 4 2 1

Therefore an attack of 15 and decay of nine would have a value of:

15*64+9*16=1056

Don't forget though that if the number is less than 100 it must still have three digits.

As mentioned before the command -0001 is used to set the sustain and release. This is worked out as for the 'Y' command; the first four bits are

the sustain and the release. For example a sustain of 3 and release of 3 would have the following pattern:

60H 80H in binary or 12+64+1 = 51 in decimal.

Therefore the command would be -50H.

This may sound complicated but once you start to see the commands you will soon find a very easy way to work out the values to follow them.

Special Effects

A number of special effects are available with Music Master, these help to make the notes played sound a little more interesting.

Oscillators

-W will oscillate any notes being played. To use this command enter:

-80 to turn it on and
-80 to turn it off.

-G will alter the pulse width of any notes being played that have a pulse waveform. The format for the command is:

-57 on
-58 off

-Y is a rather special command as it will alter the waveform of any notes while they are playing. This allows for some very interesting effects. The command has the following formats:

-Y1 change to Pulse while playing.
-Y2 change to Sawtooth.
-Y3 change to Triangle.
-Y4 change to Noise.
-Y5 turn command off.

Filters

As mentioned earlier, it is possible to alter the filter settings of the MD chip with the

-F command. I'm afraid that we will have to go back to using binary again to show you how this command works. First let's have a look at what each does.

Cut Off Fc	Hi-pass	Band-pass	Lo-pass	Volume
128	64	32	16	8 4 2 1

From the above table you should be able to see why the volume can only go up to 15. As an example, let's set a band pass filter with a volume of

Look It Up

Many of the above commands seem very complicated. Obviously we can't go into how

to order to double the length of a note it is necessary to double the duration i.e. a note length that is twice as long as a note of length two and half as long as a note of length eight.

If you want to work in musical terms I usually find it best to give a note a length of eight. This means that a quarter has a length of four and a minim has a length of 16. If you require a dotted note then the length of this is half way

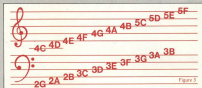


Figure 3

done. The binary pattern for this would be:

00100011

If you refer to the above table you will see that this is 38 so the command to set up the values would be

4038.

-F1 is used to set the filter cut off frequency low level. This has a range from 800 to 8007.

-F2 is used to set the high level of the Cut off frequency and has a range from 800 to 335.

-F3 is used to set the filter resonance and again requires you to use binary numbers. The number has the following format:

to use the MD chip in this article as it would take a while to enter. If however you wish to take a closer look at exactly what the above commands do then take a look in the CMOS guide and the Reference guide.

Note Format

Notes are extremely easy to enter into the data. Each note takes the form 'Octave Note Length'.

The Octave ranges from zero to seven. Zero is the lowest.

The Note has the corresponding letter i.e. A B C D E F and G.

Length is between zero and 99 and is the duration of time that the note plays.

between complete notes. Therefore if a note has a length eight then a dotted note has a length of 12 i.e. halfway between eight and 16. Figure 2 should make this a little clearer. Figure 3 shows which notes correspond to which octave.

Sharps and Flats

If you wish to use sharps then you prefix the note name with a '#' sign e.g. #C. Flats are not needed as a flat always has an equivalent sharp. For example B flat is the same as A sharp.

Rests

If you want to put rests into any voice then you must use 00 length e.g. 00A.

Length	Musical notation
2	
4	
8	
12	
16	
32	
	

Figure 2

Layout

Now that we have covered all of the available commands we can get down to writing some music.

As I have previously mentioned, the music data is broken into three sections. Before we enter any musical data into any section some items must be set to their default values. If you keep to the following rules then you should have no problems. Let's take each important line in turn.

Line 3000 should always have the following form:

```
3000 DATA -key, -type, -freq,
      -oct, -type
```

where key is a three digit number. This line sets up the initial Volume, Tempo and Filter settings. If you are not using any filters then key is 00, -1 and -4 should be 000. Do not mix this out or you could get some strange results.

Lines 3001, 3008 and 7000 should take the following form:

```
3001 DATA -freq, -type, -freq, -
      type
```

This will set up the Waveform and A256 for each voice. The "-7" command should only be added if you are using the pulse waveform.

If any voices are not being used then they should be either be packed with rests or their waveforms padded out with rests.

N.B. Music will repeat as soon as Voice 1 has finished playing.

Translating Example 1 should make things a little clearer. Lines 2 and three are

not used at all and Voice 1 plays a single musical note.

Playing Music

Once you have entered all the music, make sure you save it before attempting to play it, if you don't and you have entered something wrong then you could lose your work.

Before running any music, Music Master should be loaded into memory with

```
LOAD "MUSIC MASTER",1 (or
      disk or 1 for tape).
```

Music Master can be in memory while you are entering a program as it will not conflict with any Basic programs.

Then make sure that your Music Data is loaded and type:

```
SYS 49152
```

This will cause the music data to be read into memory from location 20000 onwards.

To play the music you simply have to enter the command:

```
SYS 52000
```

the music will then start playing until you stop it with RUN/STOP and RESTORE.

The SYS 49152 and SYS 52000 can be part of any normal Basic program as long as you don't use any lines that are needed by the music data.

Once the music data has been moved into memory the Basic Data is no longer needed so you could even load in other programs and the music will continue as long as the other program doesn't use the same memory to redirect the interrupt.

Once the music data is in memory it is a simple matter to SAVE the DATA and the Running program with a machine code monitor. The Running program has from location 51000 to location 51248.

The Music data starts at location 20000 and the length can be found by entering the

following line if the Basic Data is present:

```
POKE1020000:READ AS:
      NEXT
```

When the program returns with an "Out of Data" error then STOP.

```
PRINT L3
```

The result is the length of the data in memory.

Playing Around

One small feature of Music Master is an in-built "Organ". Simply POKE location 5075 with the Octave in which you want to play and type:

```
SYS 40000
```

A picture of a keyboard will appear on screen and by pressing the keys indicated you will be able to play music.

Getting It All In

There are three parts to Music Master. MASTER LOAD is a loader for the program which displays a reminder of the instructions MASTER DATA and MASTER DATA are used to enter the machine code for Music Master into your machine.

Type in and SAVE all three programs separately. If using cassette then SAVE MASTER LOAD on a separate cassette to the other two programs.

Once all programs have been entered and saved, LOAD in MASTER DATA and RUN. Once the program has finished LOAD MASTER DATA and RUN. If you are using cassette place the cassette containing MASTER LOAD in the data recorder and make sure that it is positioned at the end of this program. Now type in the following:

```
POKE141,00 :POKE144,100
:POKE145,00 :POKE146,000
```

Now type:

```
SAVE "MUSIC MASTER",1 (1
      for disk or
      SAVE "MUSIC MASTER",1 (1
      for tape).
```

You should now have a working version of the program and should only need to LOAD "MASTER LOAD" whenever you want to use the program in future.

PROGRAM: MASTER LOAD

```
30 PRINT"LOADER",0,0,0
      MUSIC MASTER (1) FOR C64
      NEW
31 PRINT"00000,0PC11
      (C) 1984 SDP DEVELOPMENT
      COMPANY LTD.
32 PRINT"00000,0PC 41152
      : READ DATA STATEMENTS
33 PRINT"END 52000
      : PLAY MUSIC
35 PRINT"00000,0PC00000"
36 PRINT"00000-0000 : TEMPO
      (0PC00-0000 = 00,41152
      TYPE
37 PRINT"0000 = 4115000
      (0PC00-0000 = 0000
38 PRINT"0000 = 0000 01
      (0PC00-0000 = 0000 LOW
39 PRINT"0000 = 0000 00
      (0PC00-0000 = 0000 00
40 PRINT"0000 = 0000 01
      (0PC00-0000 = 0000 01
41 PRINT"0000-01 = 0000 01
      10 LOW (100 01 0000
42 PRINT"01 = 0000 00 01
      0"
43 PRINT"01 = 0100 0000
44 PRINT"00000000000000000000
      WHILE PLAYING NOTE
45 PRINT"0001-01 = 10 PULSE
      (0PC00-01 = 10 00000000
46 PRINT"01 = 10 100000
      (0PC00-01 = 10 000000
47 PRINT"01,01,01,01,01,01 =
      0001"
48 LOAD "MUSIC MASTER",1 (1
      (100 00000 10 1,1 FOR
      CASSETTE
```


PROGRAM: MASTER DATA			
2000 FOR 1-6 TO 330C+0 FOR 3-6 TO 130000 4 C3-C3000000 4722+0000 4,4,4,027 0	2110 DATA 96,192,140,0,4,172, 1,4,34,222,48,141,1,4,149, 0,1302	2220 DATA 169,9,76,224,182, 201,27,208,0,22,162,182, 169,10,76,226,2014	2330 DATA 127,4,240,31,172, 126,4,24,107,10,141,126,4, 222,76,207,1412
2000 READ 8,17 ACCT THEN PR PRINT#1000 IN (1000) 2040=10001:STOP	2120 DATA 141,9,4,172,2,4, 201,20,200,4,226,9,4,172, 2,4,1204	2230 DATA 192,201,72,200,8, 22,142,192,169,11,76,226, 192,201,74,200,2220	2340 DATA 182,172,2,4,26,122, 48,24,108,224,4,141,126,4, 96,172,1008
2000 NEXT L:END	2130 DATA 141,10,4,162,8,189, 175,184,200,10,4,200,2,76, 229,182,1017	2240 DATA 8,22,162,192,169, 12,14,226,192,201,72,200, 8,22,162,192,169	2350 DATA 9,4,240,2,222,222, 222,189,189,141,76,4, 189,101,184,2200
2000 DATA 107,0,141,104,4, 141,104,4,162,42,122,126, 162,40,122,176,1402	2140 DATA 222,204,19,144,240, 172,1,4,164,222,200,22, 172,2,4,164,2224	2250 DATA 169,12,76,226,192, 201,60,200,8,22,142,192, 169,14,76,226,2040	2360 DATA 181,77,4,224,24, 240,27,224,22,200,2,226,2, 4,226,12,1222
2000 DATA 100,0,172,170,201, 184,200,10,200,177,170, 201,11,200,2,76,2200	2150 DATA 49,200,12,162,172, 141,2,100,162,172,141,2, 160,76,77,192,1777	2260 DATA 192,201,87,200,8, 22,142,192,169,11,76,226, 192,201,80,200,2211	2370 DATA 200,174,1,4,226,2, 176,11,76,26,4,100,77,4, 226,1,1204
2000 DATA 102,172,22,40,172, 76,16,192,160,8,177,170, 170,200,177,170,2017	2160 DATA 201,20,200,10,162, 172,141,4,180,162,172,141, 1,100,76,77,1924	2270 DATA 8,22,162,192,169,4, 76,226,192,201,72,200,8, 22,142,192,169,11,76,226, 192,201,80,200,2211	2380 DATA 4,26,184,160,8, 180,76,4,100,172,200,172, 2,200,200,1000
2000 DATA 122,172,124,176,76, 167,100,122,172,140,4,222, 172,160,4,177,2040	2170 DATA 142,172,76,129,194, 24,22,200,8,12,162,192, 160,2,76,226,2044	2280 DATA 169,7,76,224,192, 201,70,200,8,22,142,192, 169,4,76,226,2024	2390 DATA 172,14,200,40,164, 4,201,44,144,12,172,4,4, 140,1,1222
2000 DATA 70,4,172,162,8, 120,127,0,4,222,224,4,200, 240,162,0,1002	2180 DATA 107,100,100,4, 22,162,192,169,4,76,226, 192,201,80,200,2200	2290 DATA 172,172,1,4,26,222, 40,141,126,4,76,226,22, 200,220,22,1020	2400 DATA 8,26,222,40,76,120, 184,172,4,4,26,222,40,141, 2,4,1400
2000 DATA 127,120,127,1,4, 122,200,200,44,240,7,201, 4,200,1,76,1922	2190 DATA 107,100,100,4, 22,162,192,169,4, 76,226,192,201,72,200,8, 22,162,192,169,11,76,226, 192,201,80,200,2200	2300 DATA 222,76,170,192,172, 4,4,26,222,40,141,127,4, 162,4,224,1807	2410 DATA 4,26,222,40,76,120, 184,172,4,4,26,222,40,141, 2,4,1400
PROGRAM: MASTER DATA2	0,189,140,204,2222	2310 DATA 102,126,127,2,212, 127,76,200,12,4,4,12,4,4, 120,14,1204	2420 DATA 100,140,71,200,172, 2,100,140,80,200,172,2, 100,140,71,200,1741
2000 FOR 1-6 TO 65C+0 FOR 3-6 TO 130000 4 C3-C3000000 22000+0000 4,4,4,027 0	2100 DATA 149,170,222,226,10, 164,246,76,49,226,12,10, 200,22,174,200,2022	2320 DATA 100,7,170,226,10, 194,140,80,189,102,200, 127,1,212,189,102,2000	2430 DATA 172,2,100,141,89, 246,140,4,141,72,226,141, 94,200,141,92,2004
2000 READ 8,17 ACCT THEN PR PRINT#1000 IN (1000) 2040=10001:STOP	2110 DATA 162,0,22,49,220, 222,224,2,144,200,120,74, 200,172,74,200,2290	2330 DATA 200,127,0,212,76, 162,4,189,76,200,112,170, 189,49,200,122,2224	2440 DATA 204,76,76,202,21, 70,200,179,172,162,172, 200,162,140,8,177,2040
2000 NEXT L:END	2120 DATA 100,160,220,141, 222,200,160,141,20,2, 160,202,141,20,2,2202	2340 DATA 172,189,72,226,122, 172,189,80,226,122,172, 189,200,102,174,2022	2450 DATA 4,212,160,170,187, 3,212,160,170,187,3,212, 160,174,157,4,2140
2000 DATA 107,0,141,18,212, 141,18,220,160,2,141,24, 200,140,22,200,1000	2130 DATA 172,120,204,200,4, 22,76,207,76,204,200,22, 40,204,107,110,2129	2350 DATA 189,76,200,122,172, 189,70,204,122,174,189,72, 204,122,172,140,2200	2460 DATA 212,162,170,214,180, 2,122,162,170,214,180, 76,187,112,204,2127
2000 DATA 120,157,112,200, 222,224,22,164,240,76,169, 1,140,22,200,162,2200	2140 DATA 107,100,201,52,40, 204,189,117,204,240,22,12, 12,202,76,2,1024	2360 DATA 200,180,177,80,204, 200,2,100,240,1,76,173,87, 204,200,1,2170	2470 DATA 160,42,204,2,240, 18,160,52,201,2,240,4,160, 12,201,2,1704
2000 DATA 102,170,197,202,107, 141,49,204,160,10,200,162, 10,140,204,160,27,160,17, 200,160,162,0,1702	2150 DATA 204,240,71,172,222, 204,4,8,22,42,204,200,4, 22,49,207,2,1024	2370 DATA 169,200,1,76,189,4, 141,70,204,160,100,141,87, 204,172,4,1922	2480 DATA 200,2,160,177,152, 127,4,212,76,1,127,70,207, 76,20,200,1891

3440 0478 172,162,170,34,182,
1,121,172,162,170,32,118,
176,34,172,1,172

3450 0478 4,126,177,176,264,
44,266,11,266,4,266,4,266,
76,176,177,264

3460 0478 34,77,172,266,74,
62,172,266,184,4,172,164,
4,266,1,266,184

3470 0478 162,4,76,47,127,42,
47,162,62,162,127,167,66,
162,31,67,166

3480 0478 172,118,74,162,31,
74,162,262,71,262,118,71,
172,162,66,262,166

3490 0478 176,48,264,166,66,
177,176,62,6,166,4,122,
122,76,167,166

3500 0478 184,62,162,4,162,
32,266,162,32,266,166,1,
162,4,266,166,162

3510 0478 252,174,127,4,4,
252,266,262,76,74,174,76,
252,74,252,177,252

3520 0478 77,62,122,161,221,
162,221,162,77,76,222,162,
222,122,77,62,162

3530 0478 222,172,221,234,
221,172,77,62,122,174,171,
122,62,62,222,122,262

3540 0478 77,52,52,76,222,
166,222,166,77,52,222,166,
221,166,221,166,222

3550 0478 67,76,222,166,221,
166,77,62,222,166,222,166,
221,166,77,76,262

3560 0478 222,166,221,166,77,
77,222,166,77,32,32,62,32,
62,32,62,166

3570 0478 32,62,62,32,32,62,
32,62,32,62,32,62,32,62,
32,62,166

3580 0478 32,62,62,62,62,
32,62,62,62,32,62,32,62,
32,62,166

3590 0478 32,32,32,62,17,62,
32,62,62,62,62,32,62,32,
62,62

3600 0478 21,62,4,62,62,76,
16,62,4,62,42,76,34,76,24,
62,62

3610 0478 1,62,32,76,1,76,14,
76,32,32,52,112,66,112,66,
112,76

3620 0478 44,112,44,112,44,
112,44,112,44,112,66,112,
44,112,44,112,112

3630 0478 44,112,44,112,44,
112,44,112,44,112,66,112,
44,112,44,112,112

3640 0478 44,52,32,52,32,32,
32,52,32,52,32,32,32,32,
32,52,66

3650 0478 11,52,32,32,32,32,
11,52,32,32,32,32,32,32,
32,52,32

3660 0478 11,32,32,32,32,32,
11,32,32,32,32,32,32,32,
32,32

3670 0478 56,42,32,32,32,32,
32,32,32,32,32,62,67,67,
62,66,76

3680 0478 67,66,76,76,66,64,
62,66,66,67,66,66,76,36,
52,32,116

3690 0478 56,32,32,46,42,62,
62,76,71,74,166,67,66,67,
76,71,116

3700 0478 42,66,166,67,66,76,
71,62,66,127,42,162,167,
172,264,162,172

3710 0478 22,262,122,234,176,
177,126,162,34,126,126,
167,172,212,236,236,236

3720 0478 246,4,1,246,21,246,
42,166,246,5,21,226,226,
246,226,246,247

3730 0478 126,266,1,4,162,4,
221,266,176,266,4,222,224,
22,166,246,226

3740 0478 74,74,166,162,1,
161,62,1,162,66,1,226,16,
164,1,74,74,66

3750 0478 226,176,224,7,164,
11,126,26,122,1,76,226,
62,1,76,124,172

3760 0478 176,167,32,32,26,
167,166,16,166,162,41,166,
162,47,5,162,172

3770 0478 42,176,141,162,1,
172,62,1,76,166,36,32,34,
177,172,62,172

3780 0478 1,262,4,246,12,236,
62,1,76,67,5,166,66,1,76,
126,122

3790 0478 166,76,162,176,161,
266,4,166,27,166,11,16,
161,224,4,76,222

3800 0478 166,4,161,4,112,
166,22,161,6,212,172,67,1,
161,1,212,167

3810 0478 172,162,1,161,4,212,
162,11,141,4,212,166,15,
164,24,212,172

3820 0478 161,4,72,76,71,
166,166,32,241,266,4,126,
26,221,16,166,177

3830 0478 226,2,144,11,226,
42,1,226,26,222,4,176,74,
246,176,126,247

3840 0478 14,166,162,32,76,
141,67,1,166,26,76,161,
62,1,167,12,166

3850 0478 166,11,62,141,226,
4,76,166,76,22,166,176,
224,4,266,2,176

3860 0478 226,67,1,76,141,
266,4,226,4,266,5,266,266,
4,76,4,172

3870 0478 4,26,227,22,32,77,
4,66,27,12,62,22,166,36,
162,4,32

3880 0478 32,62,367,127,34,
267,261,5,164,232,126,16,
162,1,176,26,172

3890 0478 226,32,146,262,76,
146,4,167,66,266,122,176,
167,67,266,122,176

3900 0478 171,177,176,161,47,
266,266,177,266,161,46,
266,172,47,266,166,166

3910 0478 66,266,266,224,74,
21,267,266,6,177,176,161,
24,112,74,24,262

3920 0478 266,226,1,266,4,
177,176,127,66,266,76,24,
266,261,1,266,217

3930 0478 6,177,176,127,61,
266,76,266,261,7,266,6,
177,176,127,262

3940 0478 66,266,76,24,266,
261,16,266,4,177,176,127,
76,266,74,162

3950 0478 266,261,24,266,6,
177,176,161,76,266,76,24,
266,261,11,266,216

3960 0478 6,177,176,161,22,
232,76,24,266,261,17,266,
6,177,176,161,166

3970 0478 22,112,74,24,266,
261,12,266,6,177,176,161,
21,212,74,24,176

3980 0478 266,266,4,266,5,
177,176,74,17,267,166,67,
266,162,266,266,216

3990 0478 167,46,266,176,171,
66,266,3,266,6,177,
176,127,162,266,216

4000 0478 76,26,266,261,4,
266,6,177,176,127,116,266,
76,26,266,261,266

4010 0478 7,266,4,127,176,
127,117,266,74,26,266,261,
6,266,5,177,172

4020 0478 176,127,116,266,
176,266,266,166,46,266,
24,122,1,127,76,262

4030 0478 266,167,67,266,162,
4,167,67,266,76,166,262,4,
7,16,61,162

4040 0478 22,62,162,172,261,
11,266,6,162,172,26,221,1,
127,4,22,162

4050 0478 6,167,121,266,24,
122,112,266,76,1,6,4,6,4,
27,77,124

4060 0478 26,62,17,12,26,26,
26,166,127,116,127,116,
222,4,4,2,164

4070 0478 126,126,126,7,1,2,
162,62,212,212,161,62,62,
127,62,1,164

4080 0478 41,22,6,6,4,1,1,62,
126,6,6,6,1,1,62,262,162

4090 0478 6,6,6,1,1,6,6,6,
6,6,6,6,6,7,167,176

4100 0478 6,6,6,6,6,6,6,166,6,
6,6,6,6,127,76,166,76,167

4110 0478 24,266,261,4,266,6,
266,261,1,76,167,266,76,6,
167,76,166

4120 0478 121,126,162,122,1,
162,122,76,126,261,24,6,
24,71,1,6,1,172

4130 0478 226,146,122,76,
22,7,122,7,122,4,162,1,6,
12,4,166

4140 0478 1,6,1,226,6,6,12,
76,7,266,7,166,1,162,12,6,
167

4150 0478 1,6,12,6,264,34,1,
62,264,4,6,66,261,56,266,
1,167

4160 0478 42,176,141,162,1,
172,62,1,76,166,36,32,34,
177,172,62,172

4170 0478 1,262,4,246,12,236,
62,1,76,67,5,166,66,1,76,
126,122

4180 0478 166,76,162,176,161,
266,4,166,27,166,11,16,
161,224,4,76,222

4190 0478 166,4,161,4,112,
166,22,161,6,212,172,67,1,
161,1,212,167

4200 0478 172,162,1,161,4,212,
162,11,141,4,212,166,15,
164,24,212,172

4210 0478 161,4,72,76,71,
166,166,32,241,266,4,126,
26,221,16,166,177

4220 0478 226,2,144,11,226,
42,1,226,26,222,4,176,74,
246,176,126,247

4230 0478 14,166,162,32,76,
141,67,1,166,26,76,161,
62,1,167,12,166

4240 0478 166,11,62,141,226,
4,76,166,76,22,166,176,
224,4,266,2,176

4250 0478 226,67,1,76,141,
266,4,226,4,266,5,266,266,
4,76,4,172

4260 0478 4,26,227,22,32,77,
4,66,27,12,62,22,166,36,
162,4,32

Programming

Joe Nicholson

continues his popular
series on the C-16.

THERE ARE TWO OTHER GRAPHICS modes available on the Commodore-16 in addition to those described in the User manual. These are Multi-Colour Character mode and Indexed Background Colour mode.

Multi-Colour Character Mode

As well as being available in high resolution, Multi-colour mode can also be made to work in low-res. Bit four of address \$1087 (\$1902) contains the 'Multi-Colour mode select bit'. It is important to make sure, however, that the other bits at this address remain unchanged. To turn Multi-Colour mode on in low resolution:

```
POKE $1087,$108 ($1087) OR 16
```

To turn Multi-Colour mode off in low resolution:

```
POKE $1087,$108 ($1087) AND 255
```

Why use Multi-Colour Character Mode? When standard character mode is used, each character has a choice of only one background colour and one foreground colour, but Multi-Colour mode allows each pixel (dot) to be any of four colours: either background colour, foreground character colour, multi-colour #1 or multi-colour #2. Each 'dot' in Multi-Colour mode is twice as wide as standard colour mode, giving half the horizontal resolution. Multi-Colour mode can be set on or off for each character on the screen, so that the Standard and Multi-Colour modes can

be mixed on the screen at the same time.

Bit three of each byte in the TED hardware area (\$0800-\$087F hex, 2648-2671 decimal) controls whether each character is in Multi-Colour mode or not. Bit three is set for Multi-Colour mode. This has the limitation of only allowing colours zero to seven to be used as the character colour, as the three used to be the highest bit of the character colour. Therefore in low resolution mode, if the colour is less than eight (zero for Black through to seven for Yellow) then the character is displayed in Standard mode; if the colour number is eight to 15 then the character is displayed in Multi-Colour mode with this background colour being the colour number minus 8. The following table should make things clearer:

Foreground Colour	Result
0-7	Standard mode. Colours 0 (Black) to 7 (Yellow)
8-15	Multi-Colour mode. Colours 0 (Black) to 15 (Yellow)

Therefore, to turn the whole screen into Multi-Colour mode (after Multi-Colour character mode has been turned on) type:

COLOR LAUNCHER

When Multi-Colour mode has been selected in each character, each character horizontal line is divided into four pairs of bits:

Bit Pair	
00	Displays the background colour
01	Displays Multi-Colour #1
10	Displays Multi-Colour #2
11	Displays the foreground character colour 0-7, which may be different, of course, for each character position on the screen.

Figure 1 shows the Multi-Colour image of an 'H' sign:

Binary	Image
00011100	— CC CC —
01100110	AA — AA BB
01101110	AA — CC BB
01101110	AA — CC BB
01100000	AA — — —
01100010	AA — — BB
00011100	— CC CC —
00000000	— — — —
Where: —	is background colour.
AA	is Multi-Colour #1.
BB	is Multi-Colour #2.
CC	is foreground colour for that character.

Multi-Colour mode has the disadvantage of doubling the hardware flash facility, which means that the cursor is not usually visible. Hence, this mode should only be used

with a TV Green). Bits 4-6 contain the luminance (R-G).

The number to be POKE'd into address \$1083 is therefore: Colour * (Luminance * 16)

The program in Figure 2 demonstrates how Multi-Colour character mode works. Please note that the triangle with a line below it represents Cursor Left symbol.

Run the program. As both Multi-Colour #1 and Multi-Colour #2 are both set to black, you should at first only see the specs of the background colour showing on the Multi-Colour characters. By pressing RETURN you can make the new Multi-Colour colour immediately change the colour of the three characters.

Programmable Multi-Colour Characters

Of course, Multi-Colour characters are of no use unless the characters are reprogrammed. As an exercise, try to create 16 multi-colour programmable characters by referring to the article in this series on programmable characters. Here: As most of the ROM characters are virtually unavailable in Multi-Colour character mode, there is no need to move a ROM character set down into the 16 block. Instead, make sure that you blank out the 'SPACE' character with zeros to stop the screen filling with rubbish. Figure 3 shows my attempt.

There now follows an explanation of the Multi-colour Programmable Characters Demo in figure 3.

100 Lowest memory 78 (see the C-16 article on 'Where to store machine code').

110 POKE's in graphics for flag.

140 POKE's zeros into the space

The C-16



character. This is needed because the ROM character set has not been shifted down into RAM.

200 Sets the Shift/Commode Key changing character set. Sets the "Base address of the character set" pointer to point to 1K below the top of the 16K RAM. Selects character set data to come from RAM.

210 Turns on Multi-Colour mode.

220 Sets SRAP to go to line 190, then jumps to line 300.

230 SRAP routine. Prints error and line number of error.

240 Turns off programmable character mode.

250 Turns off Multi-Colour mode, changes foreground to a readable colour, and LEDs.

260 Sets background colour, border colour, and clear screen.

270 Sets foreground colour to blue. Sets Multi-Colour # 2 to red. Sets Multi-Colour # 1 to white.

280-270 Print flag.

300 Play tune.

310 Pause.

320 Jumps to turn off programmable and Multi-Colour graphics modes.

3000-3110 DATA for flag.
3000-3070 DATA for mode.

Extended Background Colour Mode

Extended background colour mode gives you control of the background colour for EACH character on the screen as well as the foreground colour. Extended background colour allows, for instance, bright red text on a dark blue background on a white screen. In this mode only the first 64 characters (64 of the character set can be used. The reason is that the top two bits of each character code select the background colour. In "upper case and graphics" mode the first 64 characters contain all characters apart from graphics. In "lower/upper case mode", although the first 64 characters appear to contain only lower case, numbers and punctuation, characters written in both lower case and upper case will be displayed in upper case.

Allocation of bits to a character code in extended background character mode:

11: 1 0 1 1 1

Background: Character code colour select (0-63)

The top two bits select the background colour as follows:
00 Normal screen background colour.

01 Multi-Colour # 2 - set by the C16LED bus command.

10 Multi-Colour # 1 - can only be changed by POKEing address 65280 (\$D10) with the colour (0 for black to 15 for light green, not 1 to 16 as for the C64 OR open + the luminance (0-7 * 16, e.g. POKE 65280, 16) = 16). This POKEs Multi-Colour # 1 with light red (bit 2 of luminance 5).

11 The Extended Colour register at 65284 (\$D14). POKE to this in the same way as to address 65280, as explained above.

Hence:

a) All characters with codes 0-63 display characters 0-63 in normal background colour.

b) Characters with codes 64-127 display characters 0-63 with Multi-Colour # 2 as the background colour.

c) Characters with codes 128-191 display characters 0-63 with Multi-Colour # 1 (\$D10) as the

background colour.
d) Characters with codes 192-255 display characters 0-63 with Extended Colour (\$D14) as the background colour.

Bit 10 of address 65280 (\$D10) contains the flag that turns on or off Extended background colour mode. This bit is zero for on. When changing this bit, it is important that the other bits at that address remain unchanged.

To turn on Extended background colour mode, type:

POKE 65280,POKE 65280 OR 64

To turn off Extended background colour mode, type:

POKE 65280,POKE 65280 AND 191

As with Multi-Colour mode, a disadvantage with this mode is that the hardware flash is disabled, meaning that the cursor will not be visible. Therefore, alerting should be done in normal mode.

Figure 6 is a demonstration program of Extended Background Colour Mode. Enter it in lower case mode exactly as shown. Please note, the underlined lower case "r" represents 8755 OR.

Programming The C-16

Figure 1

```

10 REM MULTICOLOR CHARACTER DEMO
100 FOREWORD,PEEK 40000:PRINT
110 COLOR,1:COLOR,1:COLOR,1,5:COLOR
120 PRINT"MULTICOLOR MODE. COLORS 1-8 (4-7 IN NORMAL) IS
    DISPLAYED IN STANDARD MODE
    .".
130 FORA=1TO8
140 COLOR,1,5:PRINTTAB(1+1)*COLOR,1,5:PRINT"BACKGROUND
    1281600012816000:PRINT
150 COLOR,1,5:PRINT"PRINTING COLOR 1-16 (4-15 IN REM
    1 AND)"
160 PRINT"DISPLAYED IN MULTICOLOR MODE. ."
170 FORA=1TO16
180 CO,0,1,1,5:PRINTTAB(1+1)*COLOR,1,5:PRINT"BACKGROUND
    1281600012816000:PRINT
190 COLOR,1,5:PRINT"PRINTING WELL NOW (CHANGE MULTI-8) IN
    NO MULTI-8?"
200 FORA=1TO16:FORB=1TO16
210 CHA,1,1,1,"PRINT: A KEY":PRINTTAB(1+1,1)*COLOR,1,5
220 PRINT"GOO, A=14114:COLOR,1,5
230 GETTAB:PRINT"END
240 FOREWORD,PEEK 40000:PRINT

```

Figure 2

```

10 REM EXTENDED BACKGROUND COLOR DEMO
100 FOREWORD,PEEK 40000:PRINT
110 COLOR,1:7:COLOR,1,5:COLOR,1:5:COLOR
120 COLOR,1,5:FOREWORD,5-14114:FOREWORD,1,17614
130 PRINT"CHARACTERS 0-45 ARE DISPLAYED IN NORMAL BACKS
    ROUND COLOR..."
140 PRINT"BACKGROUND"
150 GETTAB
160 PRINT"PRINT"CHARACTERS (4-12) ARE DISPLAYED IN,"NO
    LTSCOLORS."
170 PRINT"THIS HAS BEEN SET TO RED USING THE ",COLOR,
    1,5:COMMAND..."
180 PRINT"14,16,18,20,22,24,26,28,30,32,34,36,38,40,42"
190 GETTAB
200 PRINT"PRINT"CHARACTERS (20-19) ARE DISPLAYED IN,"IN
    ULTICOLORS"
210 PRINT"THIS HAS BEEN SET TO CYAN BY USING THE",COLOR
    1,5:COLOR,1,14114:COMMAND..."
220 PRINT"140000000000000000"
230 GETTAB
240 PRINT"PRINT"CHARACTERS (10-20) ARE DISPLAYED IN,"IN
    EXTENDED COLOR"
250 PRINT"THIS HAS BEEN SET TO LIGHT BLUE BY,"USING IN
    FOREWORD,1,17614:COMMAND
260 GETTAB
270 PRINT"140000,16,18,20,22,24,26,28,30,32,34,36,38,40,42"
280 GETTAB
290 FOREWORD,PEEK 40000:PRINT

```

Figure 3

```

10 REM MULTICOLOR PROGRAMMABLE
20 REM CHARACTER DEMO
300 FOREWORD,PEEK 40000,10:PRINT
150 FORA=1TO16:FORB=1TO16:FORC=1TO16:FORD=1TO16:FOR
    160 FORA=1TO16:FORB=1TO16:FORC=1TO16:FORD=1TO16:FOR
200 PRINT"CHAR (1) FOREWORD,10:FOREWORD,PEEK 40000:PRINT
    50
210 FOREWORD,PEEK 40000:PRINT
220 TAB(150,150)GOTO100
230 PRINT"CHAR (1),1
240 FOREWORD,10:FOREWORD,PEEK 40000:PRINT
250 FOREWORD,PEEK 40000:PRINT"COLOR,1,2,7:END
300 COLOR,1:COLOR,1:5:COLOR
310 COLOR,1,5:COLOR,1,5:FOREWORD,1,17614
320 CHA,1,1,1,"GO TO 100 100 100 100 100 100 100 100"
330 PRINT"100 100 100 100 100 100 100 100"
340 FORA=1TO16:FORB=1TO16:FORC=1TO16:FORD=1TO16:FOR
350 FOREWORD,PEEK 40000:PRINT
360 GETTAB
370 PRINT"PRINT"CHARACTERS (4-12) ARE DISPLAYED IN,"NO
    LTSCOLORS."
380 PRINT"THIS HAS BEEN SET TO RED USING THE ",COLOR,
    1,5:COMMAND..."
390 PRINT"14,16,18,20,22,24,26,28,30,32,34,36,38,40,42"
400 GETTAB
410 PRINT"PRINT"CHARACTERS (20-19) ARE DISPLAYED IN,"IN
    ULTICOLORS"
420 PRINT"THIS HAS BEEN SET TO CYAN BY USING THE",COLOR
    1,5:COLOR,1,14114:COMMAND..."
430 PRINT"140000,16,18,20,22,24,26,28,30,32,34,36,38,40,42"
440 GETTAB
450 FOREWORD,PEEK 40000:PRINT

```


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WELCOME TO THE MACHINE

This month we start a new series by Allen Webb which will introduce you gently to the hazards of machine code.

IN THIS SERIES, I PLAN TO INTRODUCE the basics of machine code on the 6502/6502 microprocessors. Before you throw this magazine into the fire in disgust, I intend to make this series as lightweight as possible with the inclusion of examples which will be both instructive and useful. I don't intend to make you an expert in machine code - that's up to you. But you should be able to write reasonably complex programs by the time I've finished.

First, why learn machine code? Here are a few reasons.

1. It is a fast and compact language which uses the processor most efficiently.
2. It offers an intellectual stimulus by requiring a disciplined and logical approach to programming.
3. It's more fun than Basic!

Before diving into the subject, I want to consider what tools you will need to help you in your endeavours. First, you will need the necessary development software, primarily an assembler and a machine code monitor. The choice of this software is vitally important since it can mean the difference between a long, happy relationship with machine code and misery.

When you look for an assembler, you should look for the following features as a minimum:

- 1) A sensible editor for writing the source code.
- 2) An assembler which supports both labels and variables.
- 3) If possible - Macro (one of this later).
- 4) If you plan to write large programs - disk based.
- 5) Ensure that the assembler will generate a full source code listing on assembly with symbol tables, with full printer options.

A decent assembler is not cheap so look on the best you can afford, it's probably the best investment you'll make.

Similarly, the monitor should have the following features:

- 1) Full commands for the manipulation of blocks of code - including search with register, relocate.
- 2) In-built assembler and dis-assembler for "fine tuning" of code.
- 3) Debugging and tracing tools such as single step, break points etc.
- 4) Full save/load facilities with relocating load.

To help you with your search, here are some packages of note:

1. Mikro Assembler (Supernak Cartridge £27.50). This is a well loved old faithful which has been going for quite some time, not as sophisticated as some but totally reliable.

Pros

- 1) Reliable
- 2) Contains simple monitor on board
- 3) Two pass, full label facility
- 4) Allows linked disk files
- 5) Supports both serial and parallel printers.

Cons

- 1) No debugging commands
- 2) 12K limit on single block of code. To assemble larger programs, need to use a few tricks.
- 3) Perhaps a little pricey. I am advised by Peter Calver of Supernak that a version for the 128 is in the pipeline and that it will operate in 128 mode rather than simply being the 64 version (pseudo good).

2. Assembler Monitor 44 (Pit Publishing Ltd, £79.99 disk). This is a combined package which includes a monitor of fair capabilities.

Pros

- 1) Sophisticated commands for macros, conditional assembly etc.
- 2) Powerful disk options with linked files and assembly from and to disk.
- 3) Full printer options
- 4) Two pass with full labels.
- 5) Reasonable price.

Cons

- 1) Disk only
- 2) No disassembler
- 3) Need to load a separate program for alphabetic symbol tables

3. Machine Lightning (Osbi software, disk or cassette). Released as a game-writing package, the assembler is highly sophisticated and works as a stand alone.

Pros

- 1) Available on disk and cassette. Cassette version works equally well on disk files.
- 2) Custom written operating system, handles with features including DOS.
- 3) Macro, full labels.

Cons

- 1) Expensive
- 2) Instructions comprehensive but confused and poorly written
- 3) Behaves oddly if you wish to use routines in the Basic ROM. I believe this is a artefact due to the fact that the graphics command sits behind this ROM.
- 4) Non standard monitor

4. Zoom Monitor (Supernak, Disk (£14.99), Cassette (£12.99), Cartridge (£16.79)). In my opinion, this is the best British monitor I've seen (the American monitor from HBS is also pretty good). Fully relocatable so that you can avoid your object code. In light of the weak monitor in the Mikro Assembler, this is its ideal working partner.

Pros

- 1) Almost all commands you will need
- 2) Available in all formats
- 3) Loads relocatable. Tape based object codes can be forced to relocate absolutely.
- 4) Additional DOS commands and hex/decimal converters.
- 5) Format quite standard.
- 6) Assembler, disassembler and debugging commands.

Cons

- 1) I can't find any except that bidirectional scrolling isn't supported.

If you have insufficient funds but sufficient stamina, you can use two packages given in Your Commentaries:

1. Steve Carver's package in the November, December (1980) and January (1981) issues. This provides an editor, assembler and monitor and looks pretty good, but only that, it only costs the price of three issues.
2. Hypadisk gives a breath style assembler which is ideal to help you learn but perhaps insufficient for a 48K mega game.

OK, you've got the software, what other support do you need? Well, here it is (in descending order of value):

1. A copy of one of the standard works on the 6510/6502. I use Zaks although there are others (Programming the 6502 by Rodney Zaks - ISBN 0-89588-045-4).
2. A decent memory map of the 64 - the Programmer's Reference Guide is as good as any.
3. Membership to the Independent Commodore Products User Group - I read their quarterly newsletter (well, it's more of a book actually) with great relish. Membership Secretary - Jack Cohen, 30 Branchester Rd, Newbury Park, Bedford, Essex. Even if you don't want to write machine code, join. It's great value for money with hints, reviews, useful information and discounts on soft and hardware.
4. A hint to write machine code (book). But please buy with care, there's an awful lot of garbage around and I have yet to find one that really teaches machine code to a decent level.

Having said that, the Beginner's Assembly Language Course by Derek Ruth and Peter Holmes is pretty good in

that it combines a simple assembler with a decent book. Plenty of exercises are given and the standard isn't bad.

OK, let's start work. Figure 1 gives a simplified version of the 6502/6510's architecture. It's really fairly simple. The micro-processor comprises a number of registers which converse with one another by use of the data and address buses. You may find it easier to think of the registers as boxes of two sizes, eight bits and 16 bits wide. First we have the Accumulator (A, on the diagram). This register is involved in most of the data transfer and arithmetic activities. The accumulator is eight bits wide so it can only contain numbers between zero and 255 (I'll explain why shortly). Along with the accumulator, we have three other eight bit registers. The X and Y registers are similar to the accumulator but of lesser capabilities. They are mostly used as counters and temporary storage. The bits in the status register (S) are used to tell you what's happening in the processor. If, for example, a calculation results in a minus value, bit seven (the negative flag) will be set. Only seven of the status register's bits are used and these are called flags.

The microprocessor uses an area of memory (the stack) as a scratch pad to

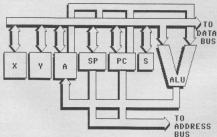
enable it to remember where it's got to. The current position of the stack is kept in the stack pointer (SP). Similarly, the microprocessor needs to know where it's got to in a program. The address of the current command is held in the program counter (PC). This is a 16 bit register holding any value between zero and 65535. That's why the 6502/6510 can only directly address a maximum of 64K, but more of that later.

Two types of basic data are represented by the system. First, a value of data. This flows along the data bus. The machine also needs to know where to stick it (no dirty comments please). Hence the address bus. The last bit of the micro is the Arithmetic Logical Unit. This performs, in conjunction with the accumulator, arithmetic and logic functions (surprised huh?). You'll appreciate the functions of the ALU once we move on to arithmetic and logic functions.

Before I finish, it's time for a little nod to activate your brain cells. I want to discuss a little about binary, bits and other handy rubbish.

First, what does 1,743 mean?

Well, I know it stands for one thousand seven hundred and thirty two but what does it represent? Well we're dealing with



SIMPLIFIED ARCHITECTURE OF THE 6510

counting to the base 10 you know, the number of fingers on ten hands).

If you accept that 1000 is 10 cubed, 100 is 10 squared, 10 is 10 to the power one and one is 10 to the power zero, we can rewrite 1712 in another way:

$$1712 = 1000 + 700 + 100 + 12$$

You may notice that the highest power of the base is the number of digits less one.

If we call the base to which we are counting *N*, then the generalized form of any number of *N* digits to that base will be:

$$D_n \times N^n + \dots + D_2 \times N^2 + D_1 \times N^1 + D_0 \times N^0$$

The *N*⁰ term appears since by convention we call the lowest digit or bit the zero digit or bit.

In binary, *N*=2, i.e. we have only two digits, one or zero. The general form for a binary number is therefore:

$$D_n \times 2^n + \dots + D_2 \times 2^2 + D_1 \times 2^1 + D_0 \times 2^0$$

$$D_n \times 2^n + \dots + D_2 \times 2^2 + D_1 \times 2^1 + D_0 \times 2^0$$

Let us consider an example, the number 1501. (The 15 sign is the conventional sign to represent binary). As with all numbers, the right hand digit is the smallest. By convention this is called the zero. The next left bit is bit one and the leftmost bit is bit two (bit binary digit). You will have noticed (you did, didn't you?) that the bit number equates to the corresponding power of two. So our example becomes:

$$1501 = 1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 1$$

Here is an eight bit number 1515001100. This is equivalent to:

$$1515001100 = 1 \times 2^7 + 1 \times 2^6 + 0 \times 2^5 + 0 \times 2^4 + 1 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 0 \times 2^0$$

which equals 128+64+8+4 = 204.

From this you should be able to prove for yourself that the largest number that an eight bit register can hold is 51111111 or 255.

For our aim, we humans cannot think easily in binary. I find decimal tough enough but binary... forget it. You need to know binary for the purpose of manipulating specific bits but that's about all. A more convenient system is to use the base 16 - the hexadecimal system. In this system, any eight bit number occupies just two digits and any sixteen bit number just four digits. As you will find, this makes life easier although you may not believe me at the moment.

If we apply *N*=16 to our general expression we get:

$$\text{Decimal value} = D_3 \times 16^3 + D_2 \times 16^2 + D_1 \times 16^1 + D_0 \times 16^0$$

$$D_3 \times 4096 + D_2 \times 256 + D_1 \times 16 + D_0$$

Consider the number 40816. There are three features to note:

1) As for binary, we prefix hexadecimal with a character so that we know what base it is in. In the case of hexadecimal, we work. Some systems, particularly users of C80 machines, use \$H.

2) Although the number only needs two digits, the two most significant digits are shown as zero.

3) If we are counting in groups of 16, how do we represent the numbers 10 through to 15?

The answer is that we pinch some alphabetic characters thus:

$$A = 10$$

$$B = 11$$

$$C = 12$$

$$D = 13$$

$$E = 14$$

$$F = 15$$

$$\text{So } 40816 = 0 \times 4096 + 0 \times 256 + 1 \times 16 + 16 = 32$$

$$\text{Similarly, consider } 110A0.$$

$$110A0 = 1 \times 4096 + 0 \times 256 + 10 \times 16 + 0 = 4352$$

$$(A=10, B=11...remember!)$$

Again, you should be able to verify that the largest numbers which can be held in eight and 16 bits are:

$$\text{eight bits, } 11111111 = 255 = 2^8 - 1$$

$$\text{sixteen bits, } 1111111111111111 = 65535 = 2^{16} - 1$$

$$65535$$

Finally, to help link what you've learned to what you should seek in an assembler, here is an imaginary piece of assembled source code.

000: CODE		←J=000
100: ARII	PARII	←JARI
120:		
130: CODE AR 01		UDA # 00000001
140: CODE 00 00 00		STA 000
150: CODE AR 00		UDA # 000
160: CODE 00 30 00		STA 00000
170: CODE 00 31 00		STA 00001
180: CODE AR 01		UDA # MESSAGE
190: CODE AR 01		LDY # MESSAGE
200: CODE 20 10 AR		SR PARI
210: CODE 04		RTS
220: CODE 00 00 00	MESSAGE	ASC "HELLO"
230: CODE 00		BYT 000
CODE 0010		

This is a composite of several assemblers but gives the general features. The first column of numbers is the line numbers used by the editor. The second column shows the addresses occupied by the assembled code. The next three hexadecimal bytes are the actual machine code. The next column holds labels and the last column holds the instructions which assist writing the program. Don't worry about the details at the moment, things will be clearer in the next part of the series. Just note two things:

1. I've deliberately used binary, decimal and hexadecimal to show their interchangeability in a decent assembler.
2. You should aim to get an assembler which offers the facilities shown.

Because I'm a fundamentally rusty person, here is your homework:

1. Write the decimal numbers zero to nine in binary.
2. Perform the following conversions:

$$10101010 \text{ to decimal}$$

$$123 \text{ to binary}$$

$$111101111 \text{ to decimal}$$

$$14100 \text{ to decimal}$$

$$1101 \text{ to hexadecimal}$$

3. For those of you who want to try a small program, write a program in Basic which will accept a binary number and convert it to decimal.

Well, that's all for this time. To help you with your searches for software, here are some addresses.

Touch Line

Supernut: Winchester 16, Canning Rd, Wreckstone, Harrow, Middlesex. Tel 01 561 1166

First Publishing: Unit 200, Hoxton Rd, Farnborough, Dorset. Tel 07527 5244

Osprey Software: Wallingford Rd, Watlington, Oxford. Tel 0181 419001

De Watson Assembly Language series - Glen Ip Publishers Ltd, Wandsworth, Lamb Place, High Street, Barnes, Herts EN5 11D.

**Stuart Cooke explains
how to make changes
to your floppy disks.**

DISK DELIVING

HOW OFTEN HAVE YOU scratched your latest programming masterpiece from your disk only to realise a few moments later that you didn't have a look up!

No doubt up until now the only option open to you was to retype the whole program from the beginning.

A little more understanding of how the 1541 disk drive works could enable you to remove most scratched programs and make numerous other changes to your disk directories.

Before you start playing around with the contents of your floppy disks it is important that you understand exactly how information is stored on them. If you don't and you start changing areas of a disk you can probably waste byte-by-byte the contents of the whole thing.

In order to make any changes to a disk you will require access to some sort of disk monitor program. This is a program that will allow you to examine the contents of any area on a disk and make changes to them. There are many disk editors available on the market and an extremely comprehensive one was published in the January 1988 issue of *Four Commodore*.

Disk Structure

Any new disk must be formatted before it can be used by the 1541 disk drive. Formatting a disk divides it into 35 circular rings called tracks. Each of these tracks is then split up further into a number of equal sized segments called sectors. Each track contains between 17 and 25 sectors. Figure 1 shows this a little more clearly. As you can see from the diagram the number of sectors is smaller towards the centre of the disk because each track is shorter.

How Much Room!

In the centre of the disk on track 18 you will find the disk information mark. Track 18 is used to keep all necessary in-

Figure 1: 1541 disk format

TRACK	NUMBER OF SECTORS
1 to 17	31
18 to 24	19
25 to 30	18
31 to 35	17

Figure 2: 1541 BAM

TRACK 18 SECTOR 0		
BYTE	CONTENTS	
0,1	\$12,\$01	Holds track and sector number of the 1st directory entry
2	\$41	Letter 'A' this indicates 1541 format
3	\$00	For future use
4-143		Map of showing free and allocated blocks 1 = Free block, 0 = used

Figure 3: Structure of BAM of a track

BYTE	CONTENTS
0	Number of available blocks in this track
1	Bit map of sectors 0 to 7
2	Bit map of sectors 8 to 15
3	Bit map of sectors 16 to 23

Figure 4: Format of directory header

TRACK 18 SECTOR 0		
BYTE	CONTENTS	
144-181		Name of disk
182,183		ID of disk
184	\$A0	A shifted space
185,186	\$32,\$41	Characters '2A' this is the format of the disk
187-170	\$A0	Shifted space
171-255	\$00	Not used

information about programs; where they are stored and how much room is free.

The first sector of track 18 is used to record which sectors of the disk have been used. This record is called the Block Availability Map or BAM. Every time you make any changes to the contents of your disk the BAM is examined so that the disk drive can find out where it can store information. The BAM is updated every time you store or scratch a file from the disk.

Figure 2 shows the contents of the first part of track 18.

Figure 2 shows that bytes four to 143 of track 18 sector zero hold the BAM. Four consecutive bytes are used to represent the BAM for each track. Figure 3 shows exactly how the information is stored.

As you are no doubt aware, a single byte can hold a number up to 255 or 11111111 in binary. From the binary representation it can be seen that each byte can store the information for

eight tracks. Each digit representing one sector. A one would tell you that the sector had been used while a zero would tell you that it was still free. For example 11111100 means that six sectors had been used.

The first byte of each group of four holds the actual number of sectors available on the relevant track. Don't forget the number of sectors gets smaller towards the centre of the disk.

Disk Info

Bytes 144 to 255 of track 18 sector zero are used to hold all the disk information. This is the information which is printed out at the top of each directory listing. Figure 4 shows exactly what information is held on this section of the disk. If you wanted to change the title or ID of a disk then it would be a simple matter to read this information into your computer using your disk monitor, make the necessary changes and then rewrite the information back to the disk.

Directory Info

The sectors from one onwards on track 18 are used to hold the file names and information relating to any program you have stored on disk. Each sector is referred to as a directory block and will hold the information for about eight files. The first two bytes of each block are used to give the track and sector of the next directory block. Figure 5 shows how each directory block is laid out. If there is no more directory information then these two bytes will hold zero.

Each of the eight program entries in each directory block is made up of 30 bytes. These are the ones that hold the information about the type of file; where it is held etc. Figure 6 shows the exact use of each of the 30 bytes.

The first byte of each program entry is used to hold the file type. If you have a look at Figure 7 you will see that there are five different types of file that can be represented. However this byte gives more information than you may at first realise.

Bits zero to two are used to indicate which of the five types of file we are looking at. Bit seven is used to tell the drive if the file is properly closed or if the file is still open. A one indicates that the file is open. An open file can be seen on a directory listing with an "O" beside the file type.

Bit six holds a very important piece of information and a large number of people are unaware of this. It is used to tell the disk drive whether or not the file is protected. Setting this bit to a "1" will prevent you

Figure 5: Format of the directory

TRACK 18 SECTOR 1	
BYTE	CONTENTS
0-1	Track and sector of next directory block
2-31	Entry of 1st file
34-63	Entry of 2nd file
66-95	Entry of 3rd file
98-127	Entry of 4th file
130-159	Entry of 5th file
162-191	Entry of 6th file
194-223	Entry of 7th file
226-255	Entry of 8th file

Figure 6: Format of directory entries

Each file entry consists of the following 30 bytes	
BYTES	CONTENTS
0	Type of file
1-2	Track and sector of 1st block of data
3-18	Filename, padded with shifted space
19-20	Track and sector of 1st side sector block (used with REL files)
21	Record length (used with REL files)
22-25	Not used
26-27	Track and sector of file when overwritten by saving a file with 0
28-29	Number of blocks in the file

Figure 7: The type of file

FILE TYPE	FILE OPEN	FILE CLOSED
DELETED	0000 0000 \$00	1000 0000 \$80
SEQUENTIAL	0000 0001 \$01	1000 0001 \$81
PROGRAM	0000 0010 \$02	1000 0010 \$82
USER	0000 0011 \$03	1000 0011 \$83
RELATIVE	0000 0100 \$04	1000 0100 \$84

Deleting the file by normal methods. A protected file can be seen on a directory listing with a '*' by the side of the program type. If you have any important files it is well worth going to the trouble of setting this bit to prevent accidental erasure.

Program Erasure

Whenever you delete a program from disk a number of changes are made to the disk. Firstly, the sectors that the program occupied are marked as being free in the RAM and

secondly, the file type is changed to a zero indicating that it has been deleted. The important thing to remember is that the program is still on disk and will remain there until another program is saved over it, probably after the next SAVE.

If you delete a file by accident and realised before you have saved another module then it is a very simple matter to retrieve it. All you have to do is find an entry for the file in the directory block and change the file type to whatever it was before. For example, if it was a program you would change the zero to 53. Your program will now be retrieved. However, the RAM will not be updated and if you save any other programs to this disk you stand a very good chance of overwriting your program. Therefore, make sure that you copy the rescued file onto a new disk.

Tutorial

It is probably worth going through a short tutorial to illustrate some of the changes that can be made. All examples are demonstrated with the disk editor that appeared in the January issue of four Commodore.

Firstly, you will need to format a new disk with the following command:

```
OPEN B,15,"NO,100,0"
```

Please make sure that the disk is blank before you enter the above command as it will wipe your disk of all information.

Next, type in the following small program and SAVE it to disk with the filename 'DMD':

```
10 REM THIS IS A VERY
20 REM SECRET TEST
30 REM PRINT(ORAM)
40 END
50 REM THE END
```

OK, so it's nothing winning but it will serve our purpose very well.

Now LOAD your disk editor program and examine the contents of track 16 sector zero. If you have a look at bytes 144 to 161 you will see that they hold the name of the disk. Figure 8 shows what you should see. Now we shall change the disk name.

Change the letters of the file name to 'DMD'. Figure 9 gives an example of how your disk should look now.

Now write the sector back to your disk with the write command and your changes will have been made per-

Figure 8

Steve's Disk Editor. "test*****"

```
Tracks:12 16 Links:12 16 Printer ports
Sector:00 0 01 1 Devices:8 Dr:0
Posn.:8FF 255 Data: 0 Number based
```

Commands:

```
CAB0: 11 FF FF 01 11 FF FF 01 "....."
CAB8: 11 FF FF 01 11 FF FF 01 "....."
CAY0: 54 45 53 54 A0 A0 A0 A0 "test...."
CAY8: A0 A0 A0 A0 A0 A0 A0 A0 "....."
CAA0: A0 A0 59 43 A0 32 41 A0 "...yc.2a."
CAA8: A0 A0 A0 00 00 00 00 00 "....."
CAB0: 00 00 00 00 00 00 00 00 "....."
CAB8: 00 00 00 00 00 00 00 00 "....."
CAC0: 00 00 00 00 00 00 00 00 "....."
CAC8: 00 00 00 00 00 00 00 00 "....."
CAD0: 00 00 00 00 00 00 00 00 "....."
CAD8: 00 00 00 00 00 00 00 00 "....."
CAE0: 00 00 00 00 00 00 00 00 "....."
CAE8: 00 00 00 00 00 00 00 00 "....."
CAF0: 00 00 00 00 00 00 00 00 "....."
CAF8: 00 00 00 00 00 00 00 00 "....."
```

Figure 9

Steve's Disk Editor. "test*****"

00, 04, 00, 00

```
Tracks:12 16 Links:12 16 Printer ports
Sector:00 0 01 1 Devices:8 Dr:0
Posn.:80 128 Data: 17 Number based
```

Commands:

```
CAB0: 11 FF FF 01 11 FF FF 01 "....."
CAB8: 11 FF FF 01 11 FF FF 01 "....."
CAY0: 44 45 40 4F A0 A0 A0 A0 "demo...."
CAY8: A0 A0 A0 A0 A0 A0 A0 A0 "....."
CAA0: A0 A0 59 43 A0 32 41 A0 "...yc.2a."
CAA8: A0 A0 A0 00 00 00 00 00 "....."
CAB0: 00 00 00 00 00 00 00 00 "....."
CAB8: 00 00 00 00 00 00 00 00 "....."
CAC0: 00 00 00 00 00 00 00 00 "....."
CAC8: 00 00 00 00 00 00 00 00 "....."
CAD0: 00 00 00 00 00 00 00 00 "....."
CAD8: 00 00 00 00 00 00 00 00 "....."
CAE0: 00 00 00 00 00 00 00 00 "....."
CAE8: 00 00 00 00 00 00 00 00 "....."
CAF0: 00 00 00 00 00 00 00 00 "....."
CAF8: 00 00 00 00 00 00 00 00 "....."
```


Figure 10

Steve's Disk Editor, "test000000000000"

Tracks: 12 18 Lba: 00 0 Printer ports
 Sector: 01 1 FF 255 Device: 8 Drive
 Posn: 002 2 Data: 0 Number based

Command:

```
CA00: 00 FF 00 11 00 4F 4E 45 ".....one"
CA08: 40 40 40 40 40 40 40 40 "....."
CA10: 40 40 40 40 40 00 00 00 "....."
CA18: 00 00 00 00 00 00 01 00 "....."
CA20: 00 00 00 00 00 00 00 00 "....."
CA28: 00 00 00 00 00 00 00 00 "....."
CA30: 00 00 00 00 00 00 00 00 "....."
CA38: 00 00 00 00 00 00 00 00 "....."
CA40: 00 00 00 00 00 00 00 00 "....."
CA48: 00 00 00 00 00 00 00 00 "....."
CA50: 00 00 00 00 00 00 00 00 "....."
CA58: 00 00 00 00 00 00 00 00 "....."
CA60: 00 00 00 00 00 00 00 00 "....."
CA68: 00 00 00 00 00 00 00 00 "....."
CA70: 00 00 00 00 00 00 00 00 "....."
CA7B: 00 00 00 00 00 00 00 00 "....."
```

moment. If you want to check this for yourself, reset your machine and load in the disk directory; you will see that the name has been changed.

Now we are going to delete a file and then recover it. Delete the test file from your disk with the following command:

ORIN,10,"0001"

If you now try to LOAD the file you will be unable to do so.

LOAD in your disk editor and take a look at track 10 sector one. Since "0001" is the first program on disk this is where it will be saved.

Figure 10 shows how your display should look. The "00" byte which indicates a scratched file has been high-lighted. Now change this number to "02" and save the write back to disk.

If you now reset your machine you should find that the example program will now load in correctly. Don't forget that if you save any more programs to that disk the recovered file will probably be deleted.

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Melbourne House's

Gyroscope really gets the

adrenalin flowing. Eric Doyle

recovered sufficiently to write

a review.

GAME

of the month

AS AN ARDENT ARCADE GAME FREAK, I often wish that my latest favourite was available for my home micro thereby saving me hundreds of pounds feeding up the machine for just one more go. Marble Madness was one such addiction in which you had to steer a marble around a treacherous course whilst being attacked on all sides by colliding objects and your opponent's marble in a race for the finish line. Now I have Gyroscope which was obviously developed by someone with a similar passion to mine but, in this case, it is a one player game.

The action takes place on a geometric landscape which has pitfalls galore. The surfaces are divided up into squares giving a 3D appearance with hills and hollows to impede your progress. Your task is to guide the gyroscope around each section and into a hole at the end of the course which leads to the next screen. Sounds like a piece of cake, doesn't it? Well it did to me but that delusion was



soon dispelled.

Crossing the landscape within the time limit and controlling the wretched gyroscope is the main preoccupation throughout the game. The gyroscope seems to have a mind of its own and renders about paying little heed to your frantic joystick manipulations. At least, that's how it seems!

The landscapes all slope downwards in ramps and terraces which vary in width and at the edge of each surface is a fatal drop which seems to attract the gyroscope like a cliff attracts a pack of lemmings, with similar tragic results.

As though this natural attraction was not enough, the Finnish programmer has devised a series of magnetic panels which 'steer' the gyroscope in the direction of an arrow painted on the panel's surface and invariably pointing to the nearest chasm. Negotiating a path through a field of these little devices is rather like walking

through a minefield in lead diving boots, just say a prayer, shut your eyes and go for it. With luck and a little quick witted thinking, you'll make it.

Paranoia is not a natural attribute of mine but I'm sure the little aliens which wander about the landscape have got it in for me. They seem to lurk in wait, knowing that they are guarding the only possible route I can take. I'm sure I can hear them cackling in anticipation of the havoc they are going to wreak when my gyroscope comes within striking distance.

Slippery glass panels mean that your gyroscope will slide about and accelerate down slopes and only by pulling the joystick in the opposite direction will you prevent disaster.

Although the rules state that seven lives are awarded, and this is indeed true

in versions for other machines, my C64 game only gives five lives and the first version would not allow me to progress beyond the third level. Melbourne House assures me that this was caused by a faulty master tape and that all the versions currently on sale are bug free. I must congratulate Melbourne House on this prompt reaction to my complaint and I am assured that anyone who may have acquired a rogue copy which may have slipped through the net will be treated with the same clarity.

The game is worth every penny and with 10 screens to cope with it will be a long time before anyone discovers the surprise at the end of the game.

Patience will be your worst enemy but if you can keep your head when all about are losing theirs, you'll be a man, my son.

KILLER GAME

LIFE AFTER DEATH



Here's the amazing **GAMEKILLER!** The cartridge that lets you zap your way through all the sprite collisions - right to the very end of your game.

Gamekiller is a revolutionary kind of survival kit. Just what you need to play today's complicated games - giving you the best chance of playing sprite collisions without losing a life.

Now you can actually see what happens at every stage of the game - and you'll find out if your game really has all the screens it claims to have!

With Gamekiller, you live to play the game through to the finish!

WARNING: It is possible that some of the games you own will not have all the levels and screens promised by the software houses. This could mean that you could send them back due to false information under the Trade Descriptions Act.

The **Robtek** Gamekiller is available from all good computer dealers. Enquiries to **Robtek** (formerly known as Robson) Ltd, 36 Market Place, Fellingdon Way, London NW11 6JF. Telephone: 01-209 0118.

Patent and copyright applied for

ROBTEK

COMMODORE
64/128K
Official Commodore
Approved Software
Product

BUSINESS FILE

Dave Crisp looks at Micro-Simplex, a computerised cashbook for small businesses.

Micro-Simplex

ALL TYPES OF BUSINESSES NEED TO KEEP accounts. Ask any person running a small business what they dread most and the answer more often than not is book-keeping and VAT.

In a business where most takings are cash and accounts are kept weekly it is quite common to find people using the Simplex D Cashbook system.

This is a manual cashbook and essentially seems to have been around since time immemorial. I used it when I first started in business and very successfully it was too.

First Steps to Computers

Many small business men have their first taste of a computer when they transfer from manual simplex to Micro-Simplex. Micro-Simplex is the computerised version of the cashbook and as such it is probably the easiest one to use. In essence it does the same jobs as the simplex cashbook but there are many more features.

The manual presumes you have no knowledge of either computers or accounting and starts from square one. It even tells you how to plug everything in.

The manual guides you in a clear logical way presenting procedures as they appear in the program. Screen dumps are found on pages where this clarifies the text and so it is possible and indeed recommended to go through the manual once or twice without using the computer.

Hardware

The program itself is in a multipart format and so between major menu-choices it is usual to hear the disc start spinning and loading that particular option. This does not take much time and is not as loud as it sounds.

Because so much information is stored it is required that you have a separate data-disc. This means that at certain times there is a considerable amount of disk swapping which after a few weeks use does get rather irritating. The answer to this is a second disc drive which makes using the program so easy it is hard to describe.

The cost of a second drive seems off-putting but do not forget if you are in a position to use Simplex then the cost of that second drive can be offset against tax.

Simplex is set up in such a way that you can upgrade from a single to twin drives mid-year without having to re-configure the system. Most of Simplex is written like this is a second disk drive which makes going into making the program easy to use.

Support

When you buy Simplex you need to register as a user. This is free but I can recommend spending another £25 and becoming a member of the Simplex Users Club. This membership entitles you to a free updating service as well as keeping you in touch with other users via a newsletter which also contains hints and tips. Membership also allows you to use the Hotline which is a godsend if you suffer any problems.

Setting Up

Before you start with Simplex you must 'configure' the system. This means

entering company details, opening balances, screen colours, type of printer being used and so on. Once done you can forget about it. Then you need to tell it a little about how you want to keep your accounts.

To do this you must set up departments for payments and receipts.

Let's take the example of a grocer as they do in the manual.

You may want to split up receipts in several headings, e.g. general takings, alcoholic drinks, cig/tobacco, and newspapers and so on or you may just want one heading; for example, general takings. This is entirely up to you when you set up. The advantage of full analysis is that it gives you far more sales information.

With regard to expenses, the same system is used. You can split your expenses into departments as above or have one heading for all your stock.

For payments on terms other than stock there are spaces to add your own plus the usual ones set up already such as heat and light, rent, rates, telephone, advertising etc.

All these headings have a number which you use when entering either receipts or payments.

When making a payment for business stock this is the information you will need to enter.

1. Payment number (used only to amend mistakes)
2. Analysis code: Enter the category number e.g. 04 for cig/alcohol
3. Date/cheque number
4. To whom paid
5. Amount
6. VAT Content (if applicable)

The format is roughly similar for other payments/receipts and takes only minutes to get the hang of.

Bank Routines

There are routines for managing payments and withdrawals from the bank as well as entering standing orders and service charges etc.

Unpaid bills

When you receive a bill it is possible to enter it as an unpaid bill. Then when you come to pay it the information is there already. These need not be entered but if



COMMUNICATION-

Link up with regular

columnist David Janda and

find out what's going on in

the communications world.

WELL, WE'RE INTO THE THIRD MONTH of the new year. No doubt many of you will have been giving a modern at Xmas and have been having a good time! If you haven't, subscribe to Micromet or Compnet yet, then now is the time to give it some serious thought. Both systems intend to introduce new features early this year and we can now expect at least one other major commercial database to start up real soon.

Micromet Bits

The big news at the time of writing in December is that Starnet is now active. Some gamers may remember Starnet when it was run on an old Piv. Bug-ridden, the game had troubles from the start, but it has been completely rewritten on the IBM (sigh).

Starnet is a game in which you - a star captain - try to increase the size of your fleet and your control over the galaxy. Main power in great quantity is required to plan each move which is made every other day. The game is very complex, and the instructions themselves cover many frames, but are essential reading, although the game is not played in real time, you can join forces with fellow players to defeat others. You can even be a double crosser and tell your fellow star captain who thinks you are on his side.

To play Starnet you have to register as a captain which costs a hefty \$99. Select yourself a romantic space name, and you'll be informed of your star status in a few days now via mail. Each move costs 25p and is done every other day. If you manage to command the Thraxo ship, your moves will be free from then on. Starnet is at page 80008000 - good luck!

The Chatlines have also been ticked up (technical wise). It is now impossible for anyone to send those multiple messages, and the system will not permit you to lose the message frame if mailbox is down.

The last snippet of Net news is that up and coming Micromet magazine Peer Problem has now been promoted to Publicity Manager (sigh).

Compnet Chatting

Compnet has now introduced Party-line, and not a moment too soon. To use Party-line you must first buy a link, program which costs 70p. The link stays in your modem unless you buy another



Are you ready for this?

STARNET is a computer-modem-ated space game, 1-300 & war game for up to 300 simultaneous players...

program or link, so you can go in and out of Party-line during a Compnet session without incurring the 70p charge each time. If you want to buy program-links then do so first, then use Party-line.

Once in, the screen is split into two windows with a Chatbox on the larger top part is used to display all the messages sent, and the bottom part is for entering your own messages and commands.

At the time of writing, Party-line costs 15p per hour with the first one min. 40 sec. free. This is so you can check news if you're in on. After that it costs 1p for each 30 seconds on.

Up to eight users can use Party-line at any one time. According to Compnet, this restriction is for practical purposes rather than technical. The idea being that if you have more than eight users at once, things get confusing. No doubt Compnet will be introducing more Party-line as time goes on. Price wise, myself and quite a few people on CNIL think it's too much.

Both Party-line and the more regular Chat online are to be found on directory 7000.

Have you ever wished you could get a directory when you are online? Well if you are online and need a disk directory

then pop along to 242 where you can link an online DMS program which is free. It's very useful in an emergency, but for long term usage why not download the Compnet host program and DMS 2.3 which are also free at 75p.

News

By the time you read this, Modern House should have released its Voyager 2 modem. The modem operates at 800/1000, 1200/75, 24/100 and has everything!

When asked about approval, Keith Rose, Modern House manager said: "Of course it's approved. The Voyagers has also been approved by the Cable Federation of Telecom for use anywhere within the Milky Way."

On a more serious note, it's clear to see that Modern House and Blaise Technology (with its Multimodem) are in fierce competition. The market is becoming saturated with modems for all reasons, and I predict that quite a few manufacturers are going to go bust before summer. I wonder what?

Warna chat with staff! Then drop me a line on Pivnet 9199167 or Compnet 80 0, JANDA.

STARNET GALACTIC INDEX

LEVEL 1
LEVEL 2
LEVEL 3
LEVEL 4
LEVEL 5
LEVEL 6
LEVEL 7
LEVEL 8
LEVEL 9
LEVEL 10
LEVEL 11
LEVEL 12
LEVEL 13
LEVEL 14
LEVEL 15
LEVEL 16
LEVEL 17
LEVEL 18
LEVEL 19
LEVEL 20
LEVEL 21
LEVEL 22
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LEVEL 83
LEVEL 84
LEVEL 85
LEVEL 86
LEVEL 87
LEVEL 88
LEVEL 89
LEVEL 90
LEVEL 91
LEVEL 92
LEVEL 93
LEVEL 94
LEVEL 95
LEVEL 96
LEVEL 97
LEVEL 98
LEVEL 99
LEVEL 100

THE GALAXY IS A TEST CURVE OF STAR SECTIONS. THE 10 TEST CURVE A SECTION NUMBER REFERS TO ITS LEVEL UP/DOWN.

(Type a 3-digit sector no. to go the)

GO TO 1 FOR DATA INFO

CORNER

Disatisfied? Unhappy about
something? Pleased with the
way Your Commodore caters
for your needs? Write and tell
us about it.

Tape Trouble

SINCE YOUR COMMODORE BOOK over Your 64, there is one most useful feature which was available and now seems to have fallen by the wayside. Master Digi-tape provided a service which could supply a tape containing all of the programs from a particular issue.

Your magazine certainly contains far more useful utilities, but for those with limited time at their disposal a similar service would be most helpful.

Trusting that you will consider this a constructive suggestion since a copy of Steve's Disk Editor should make an excellent start.

B F McMillan, Maidenhead

Thank you for your kind comments regarding the contents of the magazine, we do try to publish useful programs and maintain a very high standard of listing. However, we do realise that some of the programs are extremely long, and very difficult to type in. You, and no doubt many other readers, will be pleased to know that this issue of the magazine sees the start of the four Commodore software series. Each month we will be making new programs available on cassette. We will not be offering a disk as none of the programs are permitted to that you can easily back them up yourselves.

This month we are not only offering a cassette of most of the software in this issue but we are also making available a list of Your Commodore cassette which contains some of the best programs published from the last year, one of which is the disk editor that you mention.

Scratch'n'Save

I was very pleased to see the Disk Editor which you published in the January issue

of the magazine, I have been looking out for one for quite a while.

I have figured out how I can change specific areas on a disk but I am still a little unsure as to how the disc works. I have also been told that you can retrieve a file that has been scratched by using a disk editor. Is this so? If it is then could you please explain how you go about it.

G Maggillbottom, Bognor Regis

Steve's Disk Editor has certainly sparked up a lot of interest. We are a little limited for space on the letters page to give you a reply to your question here. However, in this issue you will find an article that explains just how a disk is made up and gives you some hints about changing the contents. You can remove a scratched file from your disk as long as you haven't saved anything else to it after the scratch command, the procedure for recovering a file is explained in the article.

C-16 Plea

I recently flicked through the January 1986 edition to read the Mastering the C-16 article only to find that it wasn't featured!

The whole of the magazine was confined to the C64 (not again!). I have been subscribing to this magazine since it first started in '84, because it devoted to collecting together Commodore products, now I find that it is just for the 64. I can't remember the last time I saw a program for the 16.

With the cheap sales of C-16s and Plus/4s currently on offer there must be a large number of these machines in use together with lots of owners who are still waiting to type in your programs. If there are no features on these machines how do you expect to get programs to publish?

Why don't you publish a games programming series like you did for the 16? 20, I'm sure it would be welcome. Or how about a listing of some of the points

that you can use on your machine?

C64 owners certainly seem to have a good time. Do I need to upgrade after getting what I thought was a good computer.

Please remember as C-16 and Plus/4 owners in your magazine in future.

Unsatified Reader, St Leonards

There has been no plan to target the owners of Commodore machines other than the C64. We do try to include programs for all of the Commodore machines every issue, some months however, this just isn't possible. Take the January issue for example Mastering the C-16 was due to be published but managed to get itself lost somewhere in one of the many processes that articles have to go through before publication. Don't despair however as the missing part will be found in this issue and for Microsoft has lots of ideas for the future.

We agree with you that there must be a lot of C-16 and Plus/4 owners out there. Not a day goes by without some query regarding these excellent little machines. But material for these machines is a little thin on the ground and very difficult to find. Surely some of you C-16 and Plus/4 owners have produced some software that you would like to share with other people or perhaps you may have discovered some interesting things about your machine. If you have then please send them in as we are on the look out for material all the time and depend on you, the reader, for quite a lot of material published in this magazine.

As for about it, all you C-16 and Plus/4 owners, why not get in touch!

As for the poor 16, even less material is around for this little beastie. We can't remember the last time that we received any material for this machine. In common 16 owners why don't you get in touch as well! Surely not all 16s are sat gathering dust in cupboards.

The Goonies

US Gold



HAVING DISCOVERED AN old treasure map, a group of kids calling themselves The Goonies set off to find the loot that will financially save their town from some greedy land development company. It is your job to get Ittley, Trail, Chunk, Andy, Mouth, Data and Stef to the treasure through eight screens of bars, skulls, deadly slime, crushing rocks and an octopus. For each screen there are two Goonies and you must save them both to overcome the problems on the screen and enter the next stage.

The immediate problems facing the Goonies on the screen are not the only ones

because they are chased by the mad Italian family the Fratelli. Mrs Fratelli is the leader but after seeing her, I somehow feel she would be better leading an Olympic shotput team!

The first screen begins in an old devilish building which has three floors. Here you must find the exit to the basement and get each Goonie out. The hazards are that Mrs Fratelli continually runs along the bottom level and any contact with her is fatal. At first the task of getting both characters out may seem difficult but with the aid of the money printer, Mrs Fratelli can soon be avoided.

Having found the exit the

next two of the intrepid explorers are placed in an underground cavern. The secret here is to find the key and open the door at the bottom. However the route to the key is littered with traps. Huge boulders try to crush you to death and electricity cables try to kill you while you cross a deep pool of water. As well as all this, a rather unfriendly but flaps wildly across the screen and contact with him results in immediate death.

The next six screens become increasingly difficult and have some bizarre problems to overcome. The third stage is very tricky and takes quite some time to master. The task is to burst a large pipe but avoid being blasted by jets of steam which are frequent. The use of the two characters is very important here if you are to succeed and an added hazard—one of the Fratelli brothers—is equipped with a gun so dodging bullets is another thing to keep in mind.

Screens four and five feature ladders and platforms while the sixth has some deadly slime to deal with. Having seen the film two months ago, I recognised all the previous screens, which gave me a slight advantage. The seventh stage however posed a

problem—on the shape of a large octopus. When I saw the film the octopus scene was cut out, and with only two men left I didn't know what to do. Somehow, with extreme luck, I managed to complete the screen and entered the final stage, where the boulder, but very definitely dead pirate, One-eyed Willie and the treasure were situated. Getting the treasure was just reward for the effort I had put in to conquer the previous screens.

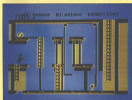
The game has an outstanding feature in playability. The essential changing of characters is done simply by pressing the fire button which allows the game to continue quickly. The degree of difficulty is very good compared to games like Pitfall II etc, and this is certainly an appealing factor. Some nice music makes the games as a whole entertaining but sadly the graphics are not up to the standard I have come to expect from US Gold. The sets in the film are excellent but the reproduction in the game is well below par. One advantage the game boasts over the film, is the fact that the characters thankfully do not speak!

No doubt the success of the film will make this a hit this year.

S.C.

Zorro

US Gold



WITH THREE LIGHTNING fast slashes of his rapier in the shape of a 'Z', Zorro comes up

yet another opponent. A quick leap onto the sofa and he bounces up to the walkway on

the other side of the room out of harm's way, at least for the time being.

Zorro is an arcade adventure based on the masked hero of the old films and TV series. Here, he is trying to rescue a beautiful woman from the clutches of the evil Sargant Garcia. Before you can reach her though, you will have several problems to solve and objects to find to help you on your quest. Naturally, you aren't told what these are and you may find things a little confusing at first.

Zorro's two trademarks are his marvellous swordplay and his mighty leaping over the rooftops, emerging from the chandeliers etc, and the game features both these attributes

prominently. The swordplay with the guards is just designed to slow you down and reduce your Zorro score but it is easy to get too careless and lose one of your lives. Leaping around requires very careful positioning and you will usually have to bounce several times on an object to gain enough height to jump up to where you want to go. Forwards, trampolines, certain rails and large rubber balls all appear.

The graphics are quite disappointing, not very clear and in uninspiring shades of brown and yellow. The effect is of some interesting ideas and problems to be solved but not particularly well implemented.

G.R.H.

> ACTION REPLAY



Fight Night US Gold



BOOKING CLAMES ARE ALL THE rage at the moment and US Gold's contender Fight Night must have a very good chance

of becoming champ. Apart from the actual bouts themselves, you have the opportunity to design your own

potential Muhammad Ali, train him and let him spar with other boxers before letting him loose in the ring.

Customisation involves selecting a head, body and legs from those given. You can name your character and change the colour of his skin and trunks etc. You then assign values to your boxer's strength in head and body punches and also what punishment he can take.

Then it's off to the gym for a spot of practice. There are eight moves to be mastered - two punches, two kicks, guard up and down and move left and right. The computer leads you through a series of training routines.

In the ring, you have those three-minute rounds to win either on points or by a knockout. The graphics and animation are excellent. You start against the number four contender, Dip Stick. He is a dirty fighter and his favourite punch is a decidedly low-one to your softer regions which brings tears to your eyes and makes your man go cross-eyed and weak-kneed. If you win, you have three more bouts to get through before you're allowed a crack at the champ.

Fight Night is the best boxing game that I have yet come across, appealing to people who both love and loathe the real thing. **GRH**

Starion

Midway Home



AT LAST, A SHOOT-EM-UP with some original features. As Starion from the Space Academy, you must fly backwards

in time trying to repair the damage in the space-time continuum, deliberately destroyed by aliens who are

your technological superiors.

You find yourself in a time grid containing nine different zones. Selecting a zone, you must destroy a specified number of enemy ships. These are superbly depicted in 3-D vector graphics. Every time you shoot one, you can pick up the alien's cargo which is in the form of a letter. After you have destroyed the entire enemy fleet, the letters you have collected need to be unscrambled in order to give you the nature of the cargo. However, solving the anagram is only half the problem. After flying through a time warp, you must decide in which time zone the cargo belongs. If you

choose correctly and visit the appropriate planet, all well and good. If not, you must battle away to another warp and try again. When you complete one grid, you are let loose on another sight. It's tough being here.

Control of the ship is fairly simple. You can bank, fire, climb and adjust your velocity. Your instrument panel has two radar screens giving the location of the enemy as well as indicators showing the number of ships to be destroyed plus fuel, oxygen and temperature levels.

Starion is a highly original space game. Well worth a look.

Falklands 82 MSX



HAVING BEEN THE BUTT OF much adverse publicity over previous titles - Theatre Europe - MSX seems likely to attract

similar attention with this latest game which is a wargame simulating the British attempt to regain the Falkland Islands

after the Argentinian invasion. You have between 25 and 90 turns to either occupy all 10 settlements or totally destroy the enemy forces. There are four potential landing sites and you can investigate the defences in two of these using the SAS and SBS. These units are important as they are the only ones with the ability to reconnoitre the surrounding area.

All your troops are given four values, an aggression factor, defence factor, movement allowance and attack range. The first two numbers will change due to the effects of combat. After you land, you

get options to move, attack (if in range) or do nothing. Combat may be at close quarters, over a distance for artillery barrages or you may summon up an air attack or naval bombardment.

Movement depends on your movement allowance and the type of terrain you are crossing. Your move might be cut short if there is an air attack and ends automatically if you move next to an enemy unit.

The graphics are simple and clear which is essential for good wargaming. There are five skill levels and the game plays very well.

GRH

Rambo Ocean

8 19 8 8



THE FILM **RAMBO: FIRST BLOOD** part II was a box office smash hit both in America and over here in England. If you have seen it, you will know that it is action all the way through with Rambo blowing up absolutely everything in sight in a desperate bid to rescue POWs against insurmountable odds and finishes off with a totally incomprehensible – but no doubt, very deep and meaningful – speech. Ocean has now written a game loosely based on the storyline of this film.

The actual game loads – preceded by a very good picture of Rambo with his rocket launcher – with absolutely incredible intensity drives music pumping away in the background. When it's

loaded, you enter your name and start.

Rambo is in the middle of the jungle. Your first task is to find the POWs camp, cut free the prisoner tied to a bamboo cross in the camp and retreat to a helicopter positioned to the north of the camp. You have a knife and a cross bow which may be loaded with normal or explosive tipped arrows but a machine gun may be picked up on the way to the camp when you pass a secret temple. In order to reach the camp, you can either blast all the patrolling soldiers with your machine gun and blow your way through with your explosive tipped arrows or you can use a knife and sneak into the camp – the former method is more risky but gains more

points. In either case, by the time you have freed the prisoner, the guards are running about with their machine guns blazing away. The best tactic here is to aim yourself with the explosive tipped arrows and blow your way through to the helicopter. One useful tip here is to keep firing. That way, any trees which could impede Rambo's progress are destroyed, together with any hostile soldiers.

Having successfully boarded the helicopter, you must then go back for the main body of prisoners. If you do manage to locate and free them without getting nicked with lead, a helicopter gunship is sent in pursuit. You have to destroy these fearsome machines – actually a Mi24 – and take the prisoners to the safety of Thailand. If you manage to do this, you go through the whole process again.

An enemy band at the bottom of the screen shows Rambo's strength reserve and this gradually decreases as he is hit by enemy fire but it is replenished upon completion of each stage. As you would expect, the game ends if the energy drops to zero.

The most distinctive feature of this game is the quality of music and the variety of sound effects. They are incredibly atmospheric and actually increase the enjoyment of the

game rather than irritate you as sometimes happens. It would go as far as to say that the quality of music (by Martin Galway, as I am reliably informed) is higher than that of the *Monty Python* comedy *Robin Hood*. Not only that, the graphics are exceptionally good too. The way in which Rambo runs around with his muscles pulsating is quite a sight and it is very satisfying when several enemy soldiers turn into skeletons and disappear into the ground with a crunch as soon as they are hit by Rambo's machine gun fire. I also like the way in which the guards fall to the ground when their watch towers were blown up.

The game is not however, a glorified shoot-'em-up. There is an element of adventure involved in actually deciding how to go about rescuing the first prisoner, locating the main body of prisoners and finding your way to Thailand.

Although the hardened arcade addict among you may find it a little easy to complete the mission, Rambo is a game which is technically brilliant and also remarkably exciting, challenging and very addictive. One interesting point however, is that you are instructed never to engage the enemy or to attempt a rescue in the instruction booklet and the games intro. I wonder if anyone is going to take this advice!

5.5

Yabba Dabba Doo Quickelle

7 4 8 5



FRED FLINTSTONE HAS fallen in love. The object of his desire is the delectable Wilma but she doesn't know it yet.

Based on the children's cartoon series *The Flintstones*, *Yabba Dabba Doo* has Fred setting out to woo Wilma in

true caveman fashion.

This he decides to do by building a house for the two of them to settle down in. Starting off with a pile of assorted stones, he must first clear the area of rubble before assembling his desirable residence. The rocks are of two types – flat ones that should be thrown into the pit and round ones which, when correctly placed, result in the appropriate bit of house appearing.

As Fred moves round collecting bits of rock, he must avoid collisions with the assorted dinosaurs. Meeting with Wilma helps enormously, as does finding his car, he also

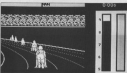
needs to earn enough money to hire a dinosaur to help him put his roof up.

The main problem with this game lies in moving Fred from screen to screen. You can only reach higher and lower screens by moving diagonally at the edge of the screen. This tends to be a very hit or miss affair, and what is wrong with the normal method of leaving a screen top and bottom, left and right, I'll never know.

Yabba Dabba Doo is a very colourful game and looks most attractive but I think that it lacks lasting appeal and I ended up being more annoyed with it than entertained. **6.0**

Run For Gold

Bill MacGibbon C-95



SURELY EVERY ATHLETE'S ambition is to win a gold medal in the Olympic Games. Run for Gold, a sports simulation from Bill MacGibbon gives you a

chance to try your luck in these events - the 400, 800 and 1500 metres. Unfortunately, when compared to other programs currently available, this one

falls well short of the medal positions.

It is some considerable time before you get your medal. You start off in small local races and if you do well enough, you are invited to take part at Crystal Palace, then the European and World Championships before you reach the Olympics and of course, you have to improve constantly if you are to progress.

The main problem with the game is that you have very little to do. Apart from determining how fast your man runs throughout the race, the only other action you have is in changing lanes and only then if

you select the hard difficulty level. There are two indicator bars, one for speed, the other for energy. The faster you go, so your energy decreases.

Graphically, the game presents a real view of your runner, who is about half the height of the winner. All the runners are shown in silhouette and there are some problems when they overtake.

Playing the game feels very much as if you are taking part in the slow motion scenes in Chariots of Fire. If you are looking for sports simulations, there are many better ones around.

C.B.H.

Kaiser

Architect D-95



IT IS GERMANY IN 1900. You rule one of nine small provinces. If you display sufficient skills in administration, financial shrewdness and

diplomacy and military tactics, you may end up being crowned Kaiser.

Based on the game Kingdoms, Kaiser is a more-

driven strategy game. Starting off with 10,000 Talers (the local currency), you begin by building in corn and land. You must feed your people a certain amount but can donate extra food in the hope of attracting immigrants. Next, you are given the population statistics for that year - births, deaths etc. You must then set the budget for the following year by adjusting levels for assumed taxes. Then it's time to spend, as you decide whether to build railways, mills or develop your army. You can also wage war, but this comes later in the game. Bad administration results in your being

suspended from office for a year.

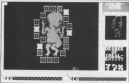
Up to nine people can play, but be warned, with each turn taking a couple of minutes, you will not finish playing in an evening. Fortunately, it is easy to save the current position. Control of the game is entirely via the joystick and is easy to master. In order to win, you must have certain assets as well as five towers, a palace and a cathedral.

Kaiser is a similar game to AP's Evil Crown but is, in my opinion, considerably more playable. If you enjoy this sort of strategy game, Kaiser is well worth considering.

C.B.H.

Deus Ex Machina

British Dreams



AT LAST SOMEONE IS EXPERIMENTING with new concepts in computer games. Deus Ex Machina is an intellectual

effort, covering the development of a renegade from infancy to death through a Shakespearean age of man-

approach in an Orwellian setting.

The package comprises two tapes, one containing the program and the other a musical and verbal accompaniment which is timed to run simultaneously with the game. The sound track boasts many famous names such as Jon Penness, Ian Dury, and Frankie Howard performing original tracks which give cryptic clues towards the purpose of each section of the game.

Although the concept is sound and the audio tape is produced to a very high standard the games themselves are disappointing and a little

ludic. Many of them are just the same game recycled with minor changes. The overall, surrealistic qualities of the overall package will limit its appeal to the older age bracket who would probably appreciate more challenging games.

Deus is certainly unique but is liable to be hyped as being far better than it actually is because of its intellectual aims. A definite example of the emperor's new clothes.

A very laudable attempt at a new concept on a different level of consciousness but a little naive in its execution.

I.D.



Revs

Printed \$11.95



VECTOR RACING. MANULATIONS have become more and more sophisticated and in complexity *Revs* is the best yet. Superbly packaged with maps of both the Brands Hatch and Silverstone circuits, all manuals, Driver's Handbook and Special Racing Programme no-one can complain about a lack of documentation.

A quick glance through the books leaves you in no doubt about the pedigree of this program with cars emblazoned with Arco Computer stickers. Unfortunately this is unfortunate because the technical consultant is David Hunt who sponsored by the said company.

Controlling the *Revs* car is

an extremely complex business and the 24 page manual guides you step by step through the driving programme which is equally applicable to the real world of motor racing as it is to the *Revs* world.

Control is exercised by keyboard keys and this is the one weakness of the simulation. An analogue joystick can be used but apart from my own reluctance I know of very few computer journalists who possess one for the 486 or some home users. A combination of paddle with keyboard or switched joystick can be used which is probably even less help unless you make your own paddle.

So it's keyboard then, and

this involves seven keys for racing which it would have been nice to have as adjustable but this program makes few concessions.

Before commencing either a practice session or a race, the driver must set the angle of the wings which hold the car down on to the road. Both front and rear wings can be set independently which gives plenty of scope for experimentation.

Starting the engine involves engaging the clutch, checking for neutral gear, pressing the starter and then the rev-counter can be increased to the required race start speed. As you can see it is just like the real thing but there is one important difference: the engine is far more tolerant of misuse.

Steering and gear changes are fairly standard procedures using the rev-counter as guide (hence the name *Revs*). If you leave the track at any time the handling of the car changes accordingly. With gear under the wheel the car will deliver about as though you are in a risk and skill is required to avoid a spin or stalling.

Wing mirrors are provided to give warning of approaching drivers who can be blocked

from overtaking by a steady bit of maneuvering.

When the course can be completed within the 1:40 time limit you are ready for competition at one of the three levels depending on whether you make the qualifying time or not.

One really excellent facility is the pseudo multiplayer race. For example, two players can individually complete a qualifying round and then they take turns to compete in a race. During such race the role of the other driver is simulated based on the qualifying round and at the end a race card is displayed showing the statistics and results.

Graphically it is obviously a comparison from a BBC and I level for more could have been done to the graphic display to make it more slick. Despite this and the fact that the sound effects are a little irritating I have got to say that this is the most realistic and difficult racing simulation which I have seen and one which I would heartily recommend though beginners may prefer to try something a little less demanding before moving on to this one.

I.D.

Scalextric

Lithium Games



WHEN I WAS A BOY my Christmas and birthday money was inevitably spent on extensions to my ever growing Scalextric racing car track.

Nowadays all this cash can be saved by investing in this game from Lithium Games.

Basically it is merely a simple Formula 1 simulation

but its advantage over the opposition is the ability to construct a track to your own design or to use one of the 17 preset tracks based on actual courses. Your own designs can then be saved and stored for future use on cassette or disk.

The app itself relies on your ability to manipulate and control the car's speed and direction and, as such, offers no advantage over the many car simulation games currently available. The only control you can exert is left and right movement, accelerate and brake. There are no gear changes or complex rules to follow.

Designing a track is great fun giving a full range of Scalextric track units such as banked curves, chicanes, four

lengths of straight track and a selection of normal curves turning through various angles. After placing the starting grid where you want it, by moving a cursor around the screen, you can pick up a piece by cursor selection and start to build up your track.

The only problem I found with this is that if you want to make a change somewhere in the middle of the track you have to remove pieces working backwards from the starting grid, change the offending piece of track and then rebuild back to the grid.

Two players can enjoy a race and I would highly recommend it to anyone who dislikes the control complication displayed by similar games.

I.D.

F Brun provides a handy routine to turn machine code into data statements.

WHEN USING MACHINE CODE, sprites, UDGs, hi res, or in fact anything that uses blocks of memory, it can be a bit of a pain to handle, as the Commodore has no built-in machine code monitor as standard. To what, you might say, I've got one here on cassette/tape/tape. Ah yes, that's dead easy to use and you could use a sprite designer to design the sprites, likewise a UDG designer for the characters. But, the major problem comes with compatibility and cloning; it is highly probable that the sprite/UDG designer will sit in the same place in memory as your beloved programs, even the 'fast' Commodore versions for machine code files and data files can get a bit messy if you don't have - or can't use - the appropriate utilities.

The simple answer is to incorporate the data into Basic Data statements. But, to do that properly you have to dump out the memory in hex to a printer (how many monitors allow you to dump decimal), convert it to decimal, and then type it all back in again.

To do this accurately you have to be at least superhuman, even a Commodore User writer, however there is an easier option.

With Data Maker, all you have to do is to save your data on disk, run the program, and then you will be left with a self-standing Basic program with neat lines of data, each line having a checksum. This is so that if at any time you get the program a bit corrupted it will sort out the mess and tell you which line the problem was in - rather than tripping the error at the 'BASIC' stage of the program, which is no use to anybody. Most magazines prefer data to have checksums in it as it reduces the amount of people who think that it is the magazine at fault rather than their own typing.

The rest of the program will automatically self-destruct - so

DATA MAKER

save it first!

The program works by directly reading the data off the disk, dumping it to a buffer area in memory. This is then read and compiled into the data statements. The checksum is calculated as it goes. The rest of the program then pulls itself up by its bootstraps and kills itself off.

The problem for tape users is that the Commodore operating system does not

allow you to read a non-data file off tape, for this you would have to carefully write a program that reads the code into memory and then writes it out byte-for-byte as a data file - remembering to make the first two bytes the load address in hi/lo format. The program could then be easily modified to read in the data file and convert this instead.

The program is restricted to 1440 of code and 240 of Basic

program data. This is because the Basic data will take up a lot more room than the original code, typically 4-6 times as much, so the buffer needs to be a lot smaller than the area left for Basic. I chose a 76/74 split because that is useful for most purposes. However, changing the poles to locations 50/76 in the line line and the value of 76/74 can alter this for a bigger or smaller proportion as you wish.

PROGRAM: DATA MAKER

```

110 DIM B(10000)/10
120 LB="00000000,00000000
    TRM(0-11,2)*1000000
    POKE 0,0:POKE 100,0:POKE 200,0
    FOR I=0 TO 10000 STEP 10
      GET I,2:VAL=0:R=0:R1=0
      FOR J=0 TO 9
        PRINT VAL;R;R1
        VAL=VAL*10+R:R=R1
      NEXT J
      PRINT VAL;R;R1
      POKE 0,1:POKE 100,1:POKE 200,1
      LB=LB+R1:R1=0
    NEXT I
    PRINT LB
    LB="00000000,00000000
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```




FROG

This month Daryl
Bowers hasn't
managed to move
mountains but he's
shifted some buildings
instead.

IN THIS MONTH'S ARTICLE we have, as promised, the frog movement routines and a joystick reading routine; in addition to all that, you can have some moving buildings (Garg Shock! Horror!). Go on then, type it in!

The first routine is "PLAYER", but its first line calls "JOYREAD", so I'll deal with that immediately. This routine was taken straight from page 441 of the Programmer's Reference Guide (hereinafter referred to as PRG) with full explanation, but I will just explain the values it returns. The registers so on have the following values:

X - x direction movement
Y - y direction movement
A - nothing
Carry flag - if clear then first button pressed

Right, all clear? Now back to "PLAYER". This routine uses several variables which are all very simple to understand. "JOYSTATUS" is zero when the joystick is not pressed. "JOYLAMP" is set to the next jump type (zero or one). "MELDOP" is the delay between frog movements; the shall look at any others later on.

The first thing - having called "JOYREAD" - is to see whether the joystick is still pressed from the last jump, and if it is, to ignore it. If it is not pressed then "JOYSTATUS" is set to zero so that the next depression of the joystick will not be ignored. If the button is pressed and it had not

been pressed previously, then "JOYSTATUS" is set to one, and "JOYLAMP" is set to one to make the next jump a large one. The effect of this is to make it necessary to press the joystick and release it every time you want to make another jump - holding it down will have no effect after the first jump.

Which brings us to "MOVE", from here no "MOVE" the program is concerned with movement in the X direction. First of all we decrease "MYXDP", and if it hasn't reached zero we branch straight to "MOVE". Next we replace "MYXDP" with 30 for the next time the routine is called.

Remembering that X still contains the value from "JOYREAD" we want to see if the joystick is being moved left or right; if only then branch to "MOVE". If it is, then branch to "LEFT", if it is, then branch to "LEFT". The next 15 lines move the frog right by one pixel, and are identical except in reverse to "LEFT", so I'll just explain this section.

The first thing we do is to see how far to the right the frog is situated on the screen. If this has reached its maximum then go to "MOVE". Otherwise we have two loops which increase all the X positions in the frog printing tables "START" and "START".

Which brings us to "MOVE", from here to the end of the routine we have a short piece of code which causes new puddles to appear on the road, but this will have no effect until the full "ROAD" routine is added next month. It starts off by decreasing a large two byte delay consisting of the variables "CRAND1" as low byte and "CRAND2" as high byte, with a total delay value of 10240-256. This means that the routine will be used only every 256th time.

Now we increase "RANDPOS" the position in our table

of random values "RANDTAB". If the value at this position is zero, then we branch to the end of the routine, "MOVE". If the value is one then we start a new puddle by setting "WATER" length of a puddle in "CRAND1". If it is 255 then we have reached the end of the table and so reset "RANDPOS" to zero. If you are wondering about the label names, the puddles started off by being black crates - but then I

forgot to print the buildings on the far right of the screen as each new character is needed. First a breakdown of the variables used:

BUILDING1 - start address of buildings table
BUILDTYPE - current building - 0 = no building
BUILDSTAGE - character columns in current building
Second a breakdown of the routine:

Lines

```

0100-0104 - Store hi-byte of "BUILDING1" in SP
0170-0180 - Check "BUILDTYPE" to see if it is 0 - if yes, go to "NOBUILD"
0170-0175 - Decrease X (BUILDTYPE); if not zero, add 40 to A, and repeat. (This sets up the correct position in the building table for the current building.)
0200-0210 - Retrieve and print characters of building pointed to by Y (BUILDSTAGE)
0420-0475 - Increase "BUILDSTAGE" - if equal to 10 then go to "NOBUILD"
0480-0520 - Add 10 to the value in Y
0530-0550 - Reset "BUILDSTAGE" to 0, get a new building type from "BUILDTYPE" to put into "BUILDTYPE", and increase "BUILDPOS"
0640-0710 - Print a blank 'building' on the right of the screen
0720-0730 - Increase "BUILDSTAGE" - if equal to 10 then go to "NOBUILD"
0800-0810 - An last month

```

thought they looked better as blue puddles!

Now we have arrived at "PBUILD" - which, if you haven't already guessed, is the

So there we have it! Next month we have two super-duper routines to print out puddles and move and animate the Frenchman. See you next



S254 PLAYER

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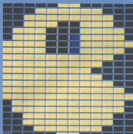
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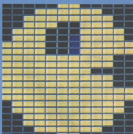
S553

S554



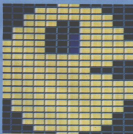
SWAPPER 1

```
DAT0000,000,000,002,170,120,010,170
DAT0100,010,150,100,002,000,160,002
DAT0000,100,170,004,170,170,004,100
DAT0170,170,160,170,170,120,170,170
DAT0000,170,170,120,170,170,160,170
DAT0170,160,170,170,170,002,170,160
DAT0002,170,160,010,170,160,010,170
DAT0100,002,170,120,000,000,000,000
```



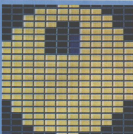
SWAPPER 2

```
DAT0000,000,000,002,170,120,010,170
DAT0100,010,150,100,002,000,160,002
DAT0000,100,170,004,170,170,004,100
DAT0170,170,160,170,170,120,170,170
DAT0000,170,170,120,170,170,160,170
DAT0170,170,170,170,170,002,170,160
DAT0002,170,160,010,170,160,010,170
DAT0100,002,170,120,000,000,000,027
```



SWAPPER 3

```
DAT0000,000,000,002,170,120,010,170
DAT0100,010,150,100,002,000,160,002
DAT0000,100,170,004,170,170,004,100
DAT0170,170,170,170,170,160,170,170
DAT0000,170,170,120,170,170,170,170
DAT0170,170,170,170,170,002,170,160
DAT0002,170,160,010,170,160,010,170
DAT0100,002,170,120,000,000,000,027
```



SWAPPER 4

```
DAT0000,000,000,002,170,120,010,170
DAT0100,010,150,100,002,000,160,002
DAT0000,100,170,004,170,170,004,100
DAT0170,170,170,170,170,170,170,170
DAT0170,170,170,170,170,170,170,170
DAT0170,170,170,170,170,002,170,160
DAT0002,170,160,010,170,160,010,170
DAT0100,002,170,120,000,000,000,024
```


Eric Doyle has been wearing
out his joystick on
Mastertronic C-16 range.

SOFTWARE SUPPORT FOR THE C-16 IS steadily growing, and Mastertronic's range of games offers good quality at the extremely low price of \$1.99 each.

I looked at seven of the titles: *Tut's Tomb*, *Squirms*, *Kings Jackpot*, *Big Mac*, *BAT's Racers* and *Formula 1 Simulator*.

Despite the lack of detailed gameplay instructions, I discovered the full rules by trial and error, which added a bit of spice to the early stages of playing.

Tut's Tomb was a prime example of living by my wits. All you are told is that "Your job is to collect all the cherries from the orchard, as they are now ripe and it's fruit picking time". The instructions then warn the player not to stand under any bad apples and to avoid the members of the bad apple gang. Beyond this you are on your own.

My previous experience with the *Big Mac* type of game helped me to cope with the first screens. This involved collecting cherries while being pursued by the bad apple gang. Assuming my secret identity of Super Strawberry, the King of the Orchard and harvesting through the orchard to collect the cherries was a relatively simple task, despite the falling apples and the attempts of the gang to foil my efforts.

C-16

BY MASTERTRONIC

Screens two offered more of the same kind of problem but proved to be slightly harder. After harvesting the fruit I was dismayed to find that the screen didn't change. Perplexed, I wandered about the screen undermining apples and tapping gangsters for the sake of something to do. Still nothing happened until the penny dropped—or, more accurately, all of the apples dropped. To complete this phase you had to get all of the apples to the bottom of the screen. Easy once you know the secret!

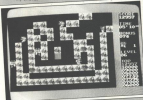
The third screen had me totally flummoxed until I realised that the idea now was to push cherry labelled boxes at the gang to eliminate them all in a Pacman-like manner. After eating cherries on all the other screens a word of explanation would have been nice here. Thank goodness I'd now explored every type of screen because

there was I, happily ignoring the instructions, when all of a sudden the lights go out and there I am in the dark groping along the passage walls. To prevent this from happening you must snap up the elusive glow worms which appear from time to time.

Success brings screen after screen of inventive mazes. This gives little time for boredom to set in despite the lack of variation in the gameplay and, just when you think you've found it all out, new little twists are introduced. As you disappear down an invisible wormhole for the first time, you wonder what on earth is happening and you start to worry once more about every move you make.

One of my all-time favourite games is *Blackjack*, which must surely have inspired Mastertronic's *Blackman*. Not that the two games are alike in anything other than the general theme of collecting diamonds and avoiding falling rocks. This explains what I like about this series of games: although the themes of the games follow traditional lines there is an obvious attempt to innovate and create interesting fusions of ideas rather than just doing a cheap copy of a successful game.

The place is Africa in the 1890's and mining fever has struck Rocky Rockman. His well-imposed task is to collect



Agony from being a danger, the apples can offer valuable assistance by blocking the path of the gangsters or by crushing a pursuer who gets underneath a falling Cherry Smith.

Although it is not mentioned in the instructions, the strawberry does possess a trick which can be very useful in the direction of an attacker. If the chik mites in its mark it will bounce around the screen until Super Strawberry collects it or it eventually hits its mark, when it will automatically return to its owner for re-use, just like a boomerang.

From this point on, though the difficulty level rises gradually, the cycle of screens follows the same pattern of initiation.

The next game for consideration was *Squirms*, which at first resembles our old friend Pacman. In this game the mazes are not inhabited with the usual ghosts but with three long wriggling worm-like creatures called squirms. One of the squirms lays eggs, as it explores the pathways of the maze, the others collect the eggs up again. I had to squirm in somewhere amongst all this so that I could collect all the eggs before the squirms got to them.

diamonds by dashing about the screen pushing boulders around and avoiding the baddies, a definite case of only being here for De Moe.

The game blends quick thinking with strategy, two almost contradictory requirements because the speed at which Rocky's air runs out leaves very little time to plan a route and calculate the consequences of your actions. The random element of baddies wandering about undermining rocks and generally messing up your strategy only adds to the feeling of panic.

Given that all of the diamonds are recoverable, the strategy involves how

to move the rocks and in what order the diamonds must be tackled. One wrong move and a gem will be trapped forever. Success is rewarded by the exit sign flashing but what if the diamonds has become blocked by falling debris? Have no fear, another exit appears elsewhere and if you die in your attempt to reach the door the game resets the boundaries to their original position and all you have to do is to dash for the exit.

All in all, it's great entertainment for gamers with roguelike tendencies.

Las Vegas is the gambling capital of the world. Without the miracle, the brash side of the American dream. This looks a fitting backdrop for Vegas Jackpot, the fruit machine simulator. The strange fascination which the good old one-armed bandit holds is a mystery to me but addictive they certainly are. Even

successfully you are allowed another gamble and so on until you decide to quit while the going's good or the win equals £100. After a little while I found that it could successfully time my gamble to win every time. After two or three such wins, Colles 88/116-mastertronic/3.

Alternately, some of the fruits have numbers and if a row has a value greater than six a number of nudges are awarded. These nudges may also be gambled but the stakes are higher because a nudge nearly always gives a win but if you gamble you can lose all your nudges and be left with nothing more than air-empire.

If a higher winning value was set for this game it would have been more challenging. And the graphical representation is adequate but I feel it could have been given greater aesthetic appeal.

Memo Aide makes of Big Mac the Mad Maintenance Man has as much to do with

revealed until near the end. By this time you've probably destroyed the only route available and keyboard suicide is the only way out.

This was one of my two firm favourites, unlike BMS, known with which I was most impressed until the bugs hit.

The idea behind BMS is to negotiate courses as quickly as possible, collecting flags and energy on the way. Playing each track is challenging, but there are more challenges here than was ever dreamed of in Mastertronic's philosophy, methods.

No doubt they would rather I described these 'extra' features as a characteristic of the game, in much the same way as a cat salesman would describe a scratch on a new Rolls Royce as a sweet-tied feature and charge extra for it. Bugs, I call them, for bugs they are. It is fair that a game which has to be completed as quickly as possible does not allow you to accelerate across the



when the money is only an electrical impulse in the heart of the machine the compulsion to play is still there. Perhaps it is the crude analogy to life in this technocratic society. Perhaps the man/machine interface has become a crucial element in society. Perhaps I'd better get on and review this game!

The object of the game is to break the bank by winning more than £100. You start the game with £100 and each pull of the lever costs £1. How you play is your own decision. You can pump the machine full of cash as you build it up as you go along. The winning £200-quad has to be in your possession, not in the machine, so I found that my tactic was to keep leading in the cash in £10 blocks.

The machine resembles a normal four drum fruit machine with all the usual features: cherries, melons, lemons etc. Reading from the left of the display, if a row of two or more of the same fruit is revealed at the end of a spin, a sum of money is awarded depending on the number on the row and the probability of the combination appearing.

A win allows you to gamble or just to collect your winnings. If you gamble

hamburgers and clemens called Ronald as it has to do with maintenance work. What it actually involves is a secret agent whose mission is to close down an enemy power plant. The air in each chamber of the plant is limited so the work has to be done quickly.

The first few problems are simply a matter of timing but gradually more and more thought has to go into the game. Zapping guns and levers to pull, as well as collapsing floors all add to the nightmare.

One excellent game feature is the ability to skip through all of the screens you have completed in previous games at the beginning of a new game. This means that you can progress faster and see what the game has to offer. If only this kind of facility was included in every microscreen epic. A coded entry at the beginning of a session would have been even better so that you could carry your progress on from day to day.

The graphics are simply but effective and some of the strategy problems are very difficult to crack because, on the later screens, the exit is not usually

fully lit! Actually, to be fair, it does allow the acceleration but it does not detect your bike crossing the line so you disappear off the top of the screen into a netherworld where you must wait until your energy runs out. Similarly if you are picking up a flag or an energy pill you fall if you are accelerating. Even some of the obstacles can be passed by accelerating through them.

The scoring system leaves a lot to be desired as well. More progress is rewarded with a higher score than a fast run because score increases with time. The essential element of a race is that all time, and convention states that the faster the competitor the greater the reward. Well, Mastertronic broke with convention when they were the first to convert into low price products so perhaps they are ready now to challenge game concepts as well.

My last belief relates to the power pills at the end of the second screen: why can't I pick it up? Perhaps there are no more

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HYPABASIC

Steve Carle provides
an excellent extended
Basic with built in
assembler.

THIS PROGRAM IS A BASIC extension which, in addition to adding a few useful commands to the resident Basic, also includes an in-line BASIC assembler.

The main code sits in 4K of memory from \$0000 to \$00FF (\$1024 to \$00FF). This means that there is 4K less Basic text space. However, this does leave the memory from \$0000 (\$0000) onwards free for machine code programs.

Both tape and disk users may make use of this program. For disk users there are a couple of disk commands to make life easier.

Entering The Program

First, type in the small Basic loader program. This will be used to load in and initialise the finished program. If you are using tape, save this as the first program on the tape with the filename utility after it.

Now type in and save the four main Basic listings below attempting to run them. Each program performs a check on the data to help guard against errors. If an error is detected, the line number is printed and execution aborted.

Program four includes instructions to save the finished program to a storage device. Be sure to change the device

Command Summary and Formats

Command	CLS
Format	CLS
Action	Clears the screen and homes the cursor
Command	HOME
Format	HOME
Action	Homes the cursor
Command	TYPE <i>fil</i>
Format	TYPE <i>fil</i> [<i>row</i> , <i>column</i>] [<i>expression</i>]
Action	Enables data to be printed at a specific screen location
Example	TYPE <i>AS/BLDG</i> "HELLO" Prints "HELLO" in the middle of the screen
Command	COLOR
Format	COLOR [<i>border</i>] [<i>screen</i>]
Action	Set border and screen colours
Example	COLOR 5,15 Sets the border to green and the screen to grey
Command	DIR
Format	DIR [<i>device</i>]
Action	Displays directory of a disk in drive with device number [<i>device</i>]. The device number is optional and defaults to 0
Examples	DIR DIR 9
Note	The device number is either 0, 9, 10 or 11. Any other number will give a BAD DEVICE error
Command	NAME
Format	NAME [<i>fil</i>] [<i>DIR</i>]
Action	As for DIR
Examples	As for DIR
Command	MEMO
Format	MEMO [<i>fil</i>] [<i>filename</i>] [<i>device</i>]
Action	Appends the named program to one already in memory
Examples	MEMO MEMO <i>AS</i> MEMO "PRNG". <i>B</i>
Command	SAVE
Format	SAVE [<i>fil</i>] [<i>filename</i>] [<i>device</i>]
Action	Loads and executes the named BASIC program
Examples	SAVE SAVE "PRNG" SAVE "TEST". <i>B</i>

number in the SAVE command to one if you are using tape.

Load and run programs one to four in sequence. The completed program will be saved and the machine will reset. Now load the Basic loader and run it. When the loading is complete, the screen will change to grey with blue border and the power-up message will be issued along with the READY prompt.

The Assembler

The assembler has been designed to work interactively with Basic, source code is held in RAM statements within a Basic program and assembled using the ASSEMBLE command. Basic variables may be passed to the assembler and different sections of code selectively assembled. The SET command is used to pass a value from the assembler to a Basic variable.

A typical program format is shown below. This simple program uses a machine-code subroutine to change the screen border colour to black.

```
10 ASSEMBLE 100,1
20 SET A="START"
30 STS A
40 END
100 REM *-C000
110 REM *-BORDER=5,100
120 REM 1
130 REM *-START LDA #100
140 REM *-A BORDER
150 REM *-TS
160 REM 1
```

Line 10 - Instructs Basic to pass control to the assembler, begin assembling at line 100 and initialise the symbol table. It's not used instead of 1 - e.g. ASSEMBLE 100,5 - then the symbol table would not be cleared. This is useful when

assembling multiple sections of code using the same symbols. (See Special Features sections.)

Line 20 — On return from assembly, the Basic variable A is given the value of assemble symbol START.

Line 30 — This is then used to call up the machine code.

Line 40 — Jumps the program. Because the source code is in RAM, leaving out this line would not incur an error.

Line 100 — This sets the start of code to 49152 (\$C000). The * directive must always be the first instruction in any source code program. (See Special Features section.)

Line 110 — This sets the symbol BORDER to \$1000.

Line 120 — The ! provides a means of inserting comments in source code.

Lines 130,140,150 — The machine code program. Note the use here of the symbol START to identify the beginning of the executable code.

Line 160 — The | signifies the end of the source code. Failure to include this at the end of the code will incur an error.

Assembler Directives

* Sets the code origin. This must be made the first line in a program. Failure to do so results in an error.

```
100 REM *-49152
```

!B Byte directive. Allows byte-sized data to be inserted into a program.

```
130 REM !B $10,$30,$15,$7FE
```

!B Word directive. Similar to !B, but works on 16-bit values.

```
240 REM !W $10,$40,$1200,  
$1200,$C000
```

% Test directive. Allows insertion of ASCII test.

```
300 REM %C$NAME$C$101$
```

! Comment — 30 REM ! THIS IS A COMMENT

| End of source directive. Must be the last line of a source program.

```
1000 REM |
```

. Define symbol. Only used when giving a symbol a value.

Command REN
Format REN [-line number-]/increment
Action Renumbers lines in a BASIC program. Does not renumber GOTO, GOSUB, etc.
Examples REN start line 10, inc. 10
REN 40,30 (start line 40, inc. 30)
Note * This command is direct mode only *

Command DEL
Format DEL [-linenumber-]/linenumber
Action Deletes lines in a Basic program. Giving a non-existent line incurs an error.
Examples DEL 40,70 (Deletes lines 40-70)
DEL 1000,1100 (Deletes lines 1000-1100)
Note * This command is direct mode only *

Command ALINE
Format ALINE [-linenumber-]/increment
Action Provides automatic line numbering for easy insertion of Assembly-language. In addition to the line number, a \$L\$ is printed. Edit auto mode by entering a left arrow (-).
Examples ALINE start 10, inc. 10
ALINE 700 (start 70, inc. 10)
ALINE 70,20 (start 70, inc. 20)
Example of editing auto mode
1070 \$L\$4 |
1080 \$L\$4 — (entered — to exit.)

Command OLD
Format OLD
Action Reverses the action of NEW, i.e. recovers a deleted program.
Note * will not work if an error has occurred since NEWing the program *

Command C\$
Format C\$ [-"Filename"/-device- & add1/-add2-]
Action Saves a block of memory - add1 - to - add2 - to the specified - device -
Example C\$ "MC" \$L\$, \$M\$, \$M\$, \$M

Command CLD
Format CLD [-"Filename"/-device- & [-L] /add1-]
Action Loads a block of memory from a device
Examples CLD
CLD "MC", 1
CLD "MC" \$L\$, \$M\$, \$M\$ (reloading load)

Command DISK
Format DISK "command string"/-device-
Action Sends a command to a disk drive. If no - device - is specified, default device B is used.
Examples DISK "V"
DISK "M-MC" \$

Command CCRD
Format CCRD
Action Performs a code reset. Symbol table is reset

Command LCRAM
Format LCRAM - add1
Action Tests location of memory for BASIC test. The message "ARE YOU SURE (Y/N)" will be issued. Relocation of the location of memory will occur only if reply is "Y".

Example LCRAM \$M\$4
ARE YOU SURE (Y/N) (machine response)
Note * direct mode only *

```
370 REM $C$M$4-$M$4  
380 REM $T$ARE $Y$N  
390 REM $C$A $C$M$4
```

Line 370 assigns the value \$C\$M\$4 to \$C\$M\$4.

Line 380 assigns the current code assembly address to \$T\$ARE.

Line 390 shows how a symbol is referenced from within a command.

Note in line 380 that a colon (:) separates the symbol from the instruction. This convention must be followed and may be applied to multiple statements.

```
1000 REM $D $M $M $M $M $M  
$T$ARE
```

will assemble correctly.

Assembler Operators

- Takes the low order byte of a 16-bit value.

```
200 REM $D$A - $Y$M$B$C (low  
order byte)
```

+ Takes the high order byte of a 16-bit value.

```
210 REM $D$A + $Y$M$B$C (high  
order byte)
```

\$ Hexadecimal number. The following number is to be treated as a hex quantity.

```
230 REM $D$X $F$0  
240 REM $D$X $L$1
```

\$ ASCII immediate mode (see line 130 above).

% Binary number. Treat the following number as an 8-bit binary number.

```
700 REM $D$A % $Y$M$B$T$1  
(must be 8 digits)
```

' Treat the following character as an ASCII code.

```
710 REM $D$A ' $A
```

Used to evaluate the pointer to a Basic variable.

```
800 REM $D$A - @ $A  
(1200 $C$M$B$C)  
910 REM $D$A @ - @ $A  
(1024 $C$M$B$C)
```

Used when using BASIC floating point routines. Variable must be pre-defined in BASIC.


```

200 DATA 282,32,39,173,73,78,88,232,71,78,89,388,88,77,
45, 1897
300 DATA 73,88,73,88,3,88,78,33,184,88,78,88,88,82,84,77,
1123
400 DATA 44,82,84,83,78,85,89,47,78,85,87,88,288,85,87,77,
1877
500 DATA 128,84,45,88,178,84,45,89,188,84,82,88,184,84,88,
45, 1811
600 DATA 128,84,88,82,174,84,89,45,232,78,79,88,174,88,82,
77, 1811
700 DATA 8,45,88,47,8,45,78,88,11,45,85,78,77,88,77,88, 897
800 DATA 32,47,77,88,44,47,88,88,33,47,88,89,88,48,47,
1897
900 DATA 77,47,79,82,88,73,78,47,89,74,75,88,118,74,82,82,
1292
1000 DATA 121,74,48,45,172,78,48,88,143,78,88,89,174,78,82,
82, 1848
1100 DATA 145,78,45,45,174,82,79,78,897,82,79,82,198,82,44,
47, 1848
1200 DATA 289,82,84,45,238,82,84,88,231,82,84,89,242,78,82,
88, 1897
1300 DATA 32,78,78,32,82,79,82,82,47,197,88,45,88,32,78,88,
1178
1400 DATA 49,82,82,84,77,78,288,84,78,79,32,77,45,78,88,32,
1272
1500 DATA 82,88,32,44,78,78,288,88,77,88,77,78,32,82,89,
1224
1600 DATA 88,48,78,79,198,44,45,88,32,77,78,88,187,88,78,88,
1123
1700 DATA 49,78,78,88,82,88,79,44,78,288,88,82,45,78,47,
1778
1800 DATA 72,82,82,78,71,187,82,88,77,44,78,78,32,82,89,
1271
1900 DATA 78,84,45,214,88,75,82,47,47,84,73,88,187,88,45,88,
1448
2000 DATA 32,78,88,49,82,45,78,198,73,78,78,47,45,78,32,
1219
2100 DATA 88,82,78,71,82,45,77,32,77,78,88,187,88,45,88,72,
1228
2200 DATA 88,49,88,72,47,197,221,145,234,145,247,145,2,148,
31,148, 1847
2300 DATA 78,148,42,148,35,148,48,148,77,148,88,148,288,148,
31,148, 1849
2400 DATA 148,178,88,178,189,118,148,132,34,189,118,148,132,
31,78,71, 1883
2500 DATA 184,185,1,41,234,132,3,78,145,1,7,1,132,1,78,32,
1778
2600 DATA 128,173,74,287,182,281,48,184,18,281,71,178,14,
381,28,174, 1223
2700 DATA 1,41,13,74,281,45,184,1,132,22,78,77,178,77,
121, 1831
2800 DATA 8,32,181,144,18,18,18,132,2,32,112,8,32,181,
184, 1888
2900 DATA 2,2,132,2,74,112,8,32,284,148,145,2,132,28,189,8,
1288
3000 DATA 132,31,32,121,8,31,7,147,178,1,78,32,288,148,145,
38, 1333
3100 DATA 123,31,142,1,132,38,78,31,75,147,148,1,78,281,45,
144, 1423

```

```

3200 DATA 2,281,71,174,2,34,78,34,78,281,48,144,258,281,28,
174, 1888
3300 DATA 248,34,78,32,18,177,144,1,78,74,73,147,32,121,8,
142, 1428
3400 DATA 8,134,2,281,48,248,7,281,48,248,2,78,77,178,41,13,
1287
3500 DATA 2,2,132,2,31,112,8,272,278,8,288,1,78,4,2,74, 1142
3600 DATA 31,147,32,173,148,72,17,148,144,1,78,78,121,178,
145,122, 1877
3700 DATA 188,123,148,197,2,142,192,2,142,7,181,27,127,148,
2,192, 1727
3800 DATA 18,248,78,142,7,189,178,2,145,27,282,14,248,172,
192,2, 1783
3900 DATA 174,192,2,132,122,134,122,78,188,8,177,122,112,41,
288,177, 2887
4000 DATA 122,288,2,142,8,78,147,148,132,42,288,177,122,132,
27,288, 1842
4100 DATA 177,122,132,28,78,188,41,188,42,122,132,134,122,
22,134,147, 1847
4200 DATA 188,122,34,181,122,132,122,142,121,142,8,132,122,
78,142,77, 1897
4300 DATA 144,78,74,148,147,8,148,282,19,122,187,147,178,
178,147,132, 3429
4400 DATA 42,154,44,72,32,142,144,184,144,8,177,231,288,11,
228,24, 2887
4500 DATA 288,7,142,4,32,148,144,78,78,177,42,282,48,2,288,
24, 1283
4600 DATA 178,232,174,2,288,188,44,2,289,42,288,12,288,198,
2,288, 2888

```

PROGRAM PART2

```

10 CLS:V=0:W=0
20 FOR L=1000 TO 700 STEP -100
30 FOR P=0 TO 14:GOTO 40:P=P+1
40 P=0:GOTO 1000
50 READ T:IF T=1 THEN PRINT"DOWNDATA CROSS IN LINE"GO
100
60 NEXT
70 PRINT"DOWNDOWN LOAD PART2"
80 END
900 DATA 288,182,8,32,148,144,58,78,148,7,78,181,42,122,42,
142, 1423
1100 DATA 44,182,8,122,44,178,145,42,78,214,147,32,17,177,
178,2, 1423
1200 DATA 142,7,74,142,144,188,8,177,122,32,32,187,144,11,
132,41, 1278
1300 DATA 1,288,192,7,288,281,78,32,148,148,48,2,34,132,181,
122, 1787
1400 DATA 121,122,145,122,189,8,132,122,78,32,281,147,178,1,
142,2, 1778
1500 DATA 78,32,181,148,188,7,177,42,122,78,288,177,42,122,
91,32, 1781
1600 DATA 188,148,32,1,121,8,288,41,288,7,288,41,288,2,78,132,
148, 1823

```


179 0476 72,77,115,8,52,167,148,189,281,47,298,14,28,165,
 38,191, 1843
 180 0476 96,133,28,165,38,181, 9,133,21,94,145,98,56,339,
 28,175, 1844
 190 0476 28,165, 9,339, 9,133,21,94,145,98,133,38,145,91,
 133,31, 1844
 200 0476 96,31,145,165,76,133,152,31,121,8,398,38,398,8,32,
 115, 1857
 210 0476 8,32,131,148,34,96,381,37,389,16,31,115,8,32,44,
 147, 1892
 220 0476 148,8,133,21,145,3,133,38,38,96,281,68,248,8,281,
 42, 1893
 230 0476 288,28,72,32,133,8,32,147,148,189,281,68,248,8,
 145,21, 1899
 240 0476 133,28,189,8,133,31,38,96,32,133,8,31,175,144,38,
 96, 1900
 250 0476 281,48,248,288,281,96,288,13,31,133,168,145,71,
 144,72,133, 1900
 260 0476 38,134,21,38,96,31,32,147,148,8,32,133,148,38,96,
 381, 1900
 270 0476 27,288,34,32,133,8,133,38,148,8,133,31,32,133,8,
 34, 1907
 280 0476 96,32,18,177,176,1,76,8,175,32,17,148,32,72,148,
 324, 1908
 290 0476 3,248,7,38,96,145,339,281,1,288,2,28,96,145,3,31,
 1909
 300 0476 145,144,32,133,8,248,17,147,41,31,133,134,32,147,
 148,145, 1909
 310 0476 28,188,11,133,133,134,252,96,172,31,3,133,280,171,
 31,1, 1910
 320 0476 133,232,96,32,115,8,148,8,177,133,381,38,248,32,
 381,8, 1899
 330 0476 248, 9,144,232,238,2,389,2,483,231,248,171,78,248,
 231,142, 1910
 340 0476 8,76,142,148,34,132,181,238,132,231,145,232,182,8,
 132,232, 1911
 350 0476 76,32,115,8,281,47,288,3,76,133,145,281,68,248,3,
 31, 1915
 360 0476 8,175,32,115,8,148,38,31,232,174,32,147,148,145,
 21,248, 1901
 370 0476 3,76,72,175,148,232,234,2,288,4,148,8,145,38,145,
 231, 1931
 380 0476 234,250,248,2,234,252,31,115,8,381,68,248,8,32,
 133,8, 1912
 390 0476 76,179,147,76,31,115,8,147,38,31,232,174,32,147,
 148,146, 1899
 400 0476 232,234,2,248,31,148,8,145,28,147,232,248,145,31,
 147,232, 1923
 410 0476 145,231,28,145,3,133,231,145,232,182,8,132,133,32,
 131,8, 1911
 420 0476 288,44,248,8,32,133,8,76,278,147,96,145,232,281,1,
 248, 2009
 430 0476 7,96,31,8,147,76,177,147,31,115,8,32,37,148,31,
 131, 1917
 440 0476 8,248,12,281,38,248,8,281,41,248,3,142,3,76,142,
 146, 1899
 450 0476 32,281,147,8,174,142,3,232,134,2,48,148,3,142,3,76,
 142, 1923

460 0476 142,144,145,232,34,145,8,132,42,145,234,145,8,132,
 46,234, 1919
 470 0476 288,147,144,11,138,288,177,147,148,3,142,2,74,142,
 146,148, 1899
 480 0476 8,132,44,3,145,232,248,194,2,248,248,31,132,4,148,
 7, 1899
 490 0476 288,47,148,31,234,314,234,314,142,232,148,232,248,
 145,231,142, 1900
 500 0476 232,145,42,133,232,145,46,133,248,96,132,72,32,
 115,8,32, 1904
 510 0476 147,148,148,148,145,38,145,232,248,145,31,145,232,
 31,129,158, 1909
 520 0476 131,96,134,91,132,92,142,8,148,8,132,44,3,248,96,
 388, 1900
 530 0476 31,288,171,3,248,248,177,96,131,3,24,96,232,128,
 91,388, 1912
 540 0476 2,34,76,24,148,4,181,98,132,98,145,91,189,8,132,
 91, 1918
 550 0476 76,168,138,32,37,148,171,48,3,281,3,248,3,142,1,
 76, 1929
 560 0476 142,144,149,232,142,144,148,8,32,148,158,144,3,
 147,1,76, 1919
 570 0476 145,27,142,145,148,75,31,148,158,144,3,148,1,76,
 147,129, 1914
 580 0476 142,145,148,31,32,148,158,148,3,148,3,96,76,131,
 158,177, 1871
 590 0476 48,281,238,248,3,132,3,96,142,4,74,142,144,147,
 142,31, 1873
 600 0476 238,134,281,42,288,32,145,232,248,3,238,232,31,48,
 148,76, 1920
 610 0476 116,131,72,142,232,248,3,142,8,76,142,144,148,241,
 91,288, 1912
 620 0476 1,76,281,32,248,3,76,116,131,281,44,248,4,32,31,
 158, 1899
 630 0476 74,116,131,281,34,248,15,32,91,148,76,116,131,281,
 31,248, 1862
 640 0476 8,32,145,147,76,116,131,32,37,177,174,3,142,1,76,
 142, 1863
 650 0476 146,32,231,132,31,14,138,32,131,8,281,8,248,7,281,
 38, 1857
 660 0476 248,8,76,8,172,32,142,147,76,37,131,32,132,8,76,
 34, 1900
 670 0476 131,148,8,132,232,32,32,147,145,92,141,142,2,145,
 76,141, 1914
 680 0476 148,3,32,131,174,281,72,248,3,248,31,248,32,145,8,
 76, 1907
 690 0476 142,144,171,177,147,174,198,147,132,133,134,238,
 32,115,8,248, 1863
 700 0476 256,32,76,147,32,198,147,32,28,128,238,232,171,
 147,3,132, 1898
 710 0476 92,133,148,3,132,96,32,198,147,32,28,131,145,131,
 146,31, 1897
 720 0476 3,145,232,141,32,3,76,115,147,31,31,158,281,2,
 248,3, 1904
 730 0476 145,8,74,2,132,281,1,248,4,15,98,132,76,2,132,32,
 1318

128 0070 220, 073, 8, 200, 21, 200, 123, 201, 1, 221, 200, 240, 100,
 123, 120, 11, 2000
 129 0070 200, 000, 75, 024, 16, 200, 105, 21, 200, 200, 177, 100, 0, 2,
 16, 077, 2000
 130 0070 102, 200, 1, 000, 122, 000, 200, 121, 122, 00, 100, 75, 121,
 12, 20, 0, 0770
 131 0070 100, 14, 0, 201, 220, 200, 4, 20, 75, 16, 2, 70, 201, 166, 201,
 202, 1000
 132 0070 124, 5, 70, 24, 167, 222, 200, 170, 121, 75, 100, 220, 202,
 240, 0, 200, 1000
 133 0070 202, 75, 124, 16, 200, 00, 202, 000, 102, 75, 124, 00, 2, 22,
 21, 170, 0710
 134 0070 200, 200, 70, 200, 100, 122, 070, 100, 20, 170, 107, 70, 07,
 100, 20, 20, 1000
 135 0070 220, 167, 22, 115, 0, 200, 200, 200, 202, 100, 202, 201, 222,
 114, 220, 122, 2000
 136 0070 202, 10, 100, 100, 100, 120, 122, 21, 100, 120, 120, 121, 20,
 21, 112, 0, 1000
 137 0070 100, 20, 0, 21, 170, 100, 160, 21, 200, 1, 160, 20, 70, 24, 75,
 170, 0000
 138 0070 12, 102, 120, 160, 220, 100, 1, 102, 07, 10, 21, 160, 100, 20,
 21, 20, 1000
 139 0070 100, 2, 121, 02, 102, 10, 100, 0, 121, 40, 70, 24, 160, 121, 102,
 120, 1000

10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	-----

01 0100-000000
02 FOR L0000 TO FOR STOP 00000
03 FOR W1 TO L00000 00000
04 FOR 0,1,2,3,4,5,6,7,8,9
05 READ 11111 NOT THEN PRINT "END OF DATA READ IN LINE" FOR
06 END
07 PRINT
08 PRINT "FINISHED PRESS ANY KEY WHEN READY TO RECALCULATE"
09 FOR FOR,0,1,2,3,4,5,6,7,8,9
10 FOR 01,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19
11000 "BACALAN",0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114,115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,130,131,132,133,134,135,136,137,138,139,140,141,142,143,144,145,146,147,148,149,150,151,152,153,154,155,156,157,158,159,160,161,162,163,164,165,166,167,168,169,170,171,172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,187,188,189,190,191,192,193,194,195,196,197,198,199,200,201,202,203,204,205,206,207,208,209,210,211,212,213,214,215,216,217,218,219,220,221,222,223,224,225,226,227,228,229,230,231,232,233,234,235,236,237,238,239,240,241,242,243,244,245,246,247,248,249,250,251,252,253,254,255,256,257,258,259,260,261,262,263,264,265,266,267,268,269,270,271,272,273,274,275,276,277,278,279,280,281,282,283,284,285,286,287,288,289,290,291,292,293,294,295,296,297,298,299,300,301,302,303,304,305,306,307,308,309,310,311,312,313,314,315,316,317,318,319,320,321,322,323,324,325,326,327,328,329,330,331,332,333,334,335,336,337,338,339,340,341,342,343,344,345,346,347,348,349,350,351,352,353,354,355,356,357,358,359,360,361,362,363,364,365,366,367,368,369,370,371,372,373,374,375,376,377,378,379,380,381,382,383,384,385,386,387,388,389,390,391,392,393,394,395,396,397,398,399,400,401,402,403,404,405,406,407,408,409,410,411,412,413,414,415,416,417,418,419,420,421,422,423,424,425,426,427,428,429,430,431,432,433,434,435,436,437,438,439,440,441,442,443,444,445,446,447,448,449,450,451,452,453,454,455,456,457,458,459,460,461,462,463,464,465,466,467,468,469,470,471,472,473,474,475,476,477,478,479,480,481,482,483,484,485,486,487,488,489,490,491,492,493,494,495,496,497,498,499,500,501,502,503,504,505,506,507,508,509,510,511,512,513,514,515,516,517,518,519,520,521,522,523,524,525,526,527,528,529,530,531,532,533,534,535,536,537,538,539,540,541,542,543,544,545,546,547,548,549,550,551,552,553,554,555,556,557,558,559,560,561,562,563,564,565,566,567,568,569,570,571,572,573,574,575,576,577,578,579,580,581,582,583,584,585,586,587,588,589,590,591,592,593,594,595,596,597,598,599,600,601,602,603,604,605,606,607,608,609,610,611,612,613,614,615,616,617,618,619,620,621,622,623,624,625,626,627,628,629,630,631,632,633,634,635,636,637,638,639,640,641,642,643,644,645,646,647,648,649,650,651,652,653,654,655,656,657,658,659,660,661,662,663,664,665,666,667,668,669,670,671,672,673,674,675,676,677,678,679,680,681,682,683,684,685,686,687,688,689,690,691,692,693,694,695,696,697,698,699,700,701,702,703,704,705,706,707,708,709,710,711,712,713,714,715,716,717,718,719,720,721,722,723,724,725,726,727,728,729,730,731,732,733,734,735,736,737,738,739,740,741,742,743,744,745,746,747,748,749,750,751,752,753,754,755,756,757,758,759,760,761,762,763,764,765,766,767,768,769,770,771,772,773,774,775,776,777,778,779,780,781,782,783,784,785,786,787,788,789,790,791,792,793,794,795,796,797,798,799,800,801,802,803,804,805,806,807,808,809,810,811,812,813,814,815,816,817,818,819,820,821,822,823,824,825,826,827,828,829,830,831,832,833,834,835,836,837,838,839,840,841,842,843,844,845,846,847,848,849,850,851,852,853,854,855,856,857,858,859,860,861,862,863,864,865,866,867,868,869,870,871,872,873,874,875,876,877,878,879,880,881,882,883,884,885,886,887,888,889,890,891,892,893,894,895,896,897,898,899,900,901,902,903,904,905,906,907,908,909,910,911,912,913,914,915,916,917,918,919,920,921,922,923,924,925,926,927,928,929,930,931,932,933,934,935,936,937,938,939,940,941,942,943,944,945,946,947,948,949,950,951,952,953,954,955,956,957,958,959,960,961,962,963,964,965,966,967,968,969,970,971,972,973,974,975,976,977,978,979,980,981,982,983,984,985,986,987,988,989,990,991,992,993,994

2000 0070 142, 8, 122, 62, 122, 28, 129, 69, 129, 21, 142, 81, 144, 94,
 152, 94, 1580
 2700 0070 124, 92, 144, 1, 177, 98, 200, 1, 74, 144, 2, 142, 94, 142, 98,
 156, 1721
 2800 0070 142, 62, 142, 98, 124, 177, 98, 178, 124, 177, 98, 122, 98,
 156, 71, 162, 2052
 210 0070 42, 24, 101, 28, 122, 62, 142, 64, 101, 21, 122, 64, 144, 212,
 74, 72, 1426
 220 0070 178, 21, 212, 222, 52, 222, 174, 21, 172, 144, 142, 20, 72,
 142, 21, 72, 1770
 230 0070 21, 222, 178, 21, 172, 144, 220, 28, 200, 2, 220, 21, 144, 28,
 144, 21, 1894
 240 0070 144, 107, 21, 104, 132, 20, 149, 20, 74, 92, 222, 149, 4, 122,
 19, 22, 1400
 250 0070 212, 222, 52, 122, 4, 200, 7, 149, 1, 122, 102, 74, 4, 127, 21,
 222, 1012
 260 0070 178, 21, 172, 144, 142, 98, 144, 20, 144, 21, 52, 212, 220,
 174, 2, 74, 1846
 270 0070 24, 200, 229, 142, 42, 24, 220, 2, 72, 142, 44, 221, 4, 72, 149,
 4, 1807
 280 0070 122, 10, 21, 212, 222, 104, 144, 104, 174, 142, 10, 22, 107,
 122, 74, 222, 2014
 290 0070 122, 21, 211, 122, 200, 24, 174, 79, 22, 22, 222, 174, 22, 211,
 122, 201, 2052
 300 0070 14, 174, 64, 140, 21, 200, 100, 141, 22, 200, 74, 74, 72, 178,
 22, 102, 1700
 310 0070 120, 21, 112, 122, 200, 24, 22, 172, 144, 149, 4, 140, 142, 20,
 142, 24, 1722
 320 0070 24, 102, 1, 122, 42, 142, 21, 102, 4, 122, 44, 74, 40, 144, 2,
 114, 2274
 330 0070 144, 149, 12, 21, 214, 222, 149, 200, 140, 120, 21, 20, 171,
 52, 220, 1200
 340 0070 240, 21, 200, 79, 21, 112, 122, 200, 220, 21, 172, 144,
 142, 24, 122, 2200
 350 0070 22, 122, 24, 102, 21, 122, 24, 122, 21, 24, 98, 144, 149, 27,
 94, 149, 1201
 360 0070 142, 74, 24, 200, 22, 122, 4, 240, 22, 27, 172, 144, 142, 20,
 122, 42, 1840
 370 0070 142, 21, 122, 44, 21, 121, 4, 240, 17, 22, 222, 174, 22, 111,
 122, 74, 1724
 380 0070 204, 127, 149, 10, 122, 62, 149, 4, 122, 144, 149, 10, 122, 20,
 149, 20, 1427
 390 0070 141, 142, 2, 149, 221, 142, 149, 141, 2, 2, 142, 2, 2, 177, 2, 2,
 1490
 400 0070 201, 72, 240, 62, 142, 4, 149, 72, 127, 119, 2, 122, 224, 10,
 144, 200, 1407
 410 0070 142, 62, 142, 64, 22, 52, 220, 120, 140, 142, 10, 124, 178,
 142, 142, 4, 1497
 420 0070 2, 122, 149, 2, 124, 14, 247, 140, 2, 102, 220, 122, 127, 149,
 2, 102, 1800
 430 0070 124, 14, 244, 24, 142, 62, 149, 147, 2, 122, 42, 144, 2, 220,
 44, 74, 1440
 440 0070 121, 144, 144, 121, 140, 2, 2, 149, 144, 141, 2, 2, 149, 4, 141,
 4, 1221
 450 0070 2, 74, 44, 124, 234, 98, 122, 98, 142, 144, 24, 21, 72, 100, 22,
 222, 1470
 460 0070 109, 22, 120, 100, 22, 124, 102, 142, 4, 109, 4, 1, 127, 4, 2,
 200, 1447

479 0A79 3,122,288,245,76,32,211,155,261,25,174,32,72,32,225,174, 1748
 480 0A79 32,211,122,291,46,176,24,72,167,40,32,225,174,184,140,184, 1750
 481 0A79 174,24,32,248,225,32,121,8,76,168,174,76,72,178,142,225, 2826
 500 0A79 281,5,248,5,142,5,76,241,176,32,179,178,122,72,122,76, 1728
 510 0A79 167,178,32,225,174,168,74,32,225,174,162,74,72,142,12,72, 1872
 520 0A79 32,167,248,168,34,32,225,174,142,21,164,26,122,96,122,96, 1890
 530 0A79 162,168,24,32,72,168,76,168,167,142,122,281,128,280,1,76, 2840
 540 0A79 162,16,76,142,244,167,225,122,12,122,14,167,186,142,8,122, 1822
 550 0A79 32,124,74,32,122,116,142,186,144,187,144,280,32,177,222,12, 1782
 560 0A79 121,8,280,4,167,8,280,4,32,222,179,32,211,222,32,2, 1448
 570 0A79 127,178,167,12,168,32,164,222,32,122,225,174,66,167,12,74, 2134
 580 0A79 177,222,281,8,244,5,281,12,174,1,76,142,12,74,142,144, 1822
 590 0A79 32,121,4,288,5,168,8,74,32,127,32,211,155,32,2,127, 1482
 600 0A79 176,167,1,148,8,72,168,222,167,26,122,87,167,48,

122,86, 1826
 610 0A79 147,5,142,87,144,8,32,186,222,32,172,222,144,18,72,142, 1926
 620 0A79 284,32,177,222,186,74,247,224,168,7,122,182,146,186,22,178, 2177
 630 0A79 225,32,287,222,122,87,32,182,222,280,187,32,287,222,122,86, 2447
 640 0A79 32,182,225,286,77,164,182,124,286,224,122,182,32,287,222,72, 2577
 650 0A79 32,182,225,178,184,224,4,288,77,114,182,192,86,176,71,122, 2272
 660 0A79 148,1,178,248,4,224,182,248,227,142,8,32,176,222,166,87, 2322
 670 0A79 142,86,32,282,187,167,32,32,218,222,168,4,182,84,5,244, 2826
 680 0A79 8,32,118,222,286,280,280,147,12,12,218,222,162,8,32,176, 2227
 690 0A79 225,32,222,222,248,14,32,222,222,184,32,146,5,32,222,222, 2497
 700 0A79 248,21,148,1,248,142,142,8,32,176,222,142,184,12,172,222, 2284
 710 0A79 76,167,8,122,18,32,112,222,148,8,122,182,142,18,166,12, 1748
 720 0A79 164,44,32,212,222,144,5,74,247,224,184,144,32,212,122,148, 2284
 730 0A79 8,32,144,222,32,127,144,32,142,144,76,174,147,8,8,8, 1582

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Commodore 64

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| 4. Space Station | 15. Galactic | 25. Escape |
| 5. Space Station | 16. Galactic | 26. Escape |
| 6. Space Station | 17. Galactic | 27. Escape |
| 7. Space Station | 18. Galactic | 28. Escape |
| 8. Space Station | 19. Galactic | 29. Escape |
| 9. Space Station | 20. Galactic | 30. Escape |
| 10. Space Station | 21. Galactic | 31. Escape |
| 11. Space Station | 22. Galactic | 32. Escape |

Each game is on a 5.25" disk (11 on 5.25" disk).
 Each game is on a 5.25" disk (11 on 5.25" disk).

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3. Cascade 50 (Cassette 50) 4. Cascade 50 (Cassette 50)

5. Cascade 50 (Cassette 50) 6. Cascade 50 (Cassette 50)

7. Cascade 50 (Cassette 50) 8. Cascade 50 (Cassette 50)

9. Cascade 50 (Cassette 50) 10. Cascade 50 (Cassette 50)

Our graphics whizz, Allen Webb gives some handy routines for scrolling and rolling the screen.

TOP DRAW

THIS MONTH I WANT TO touch on the well-thrashed subject of scrolls. As you will be aware, scrolling is used as a basis for many of the arcade games available. Initially, games used character scrolls but with the hardware features of the C64, single pixel scrolls are possible.

When preparing this article, I had to make the choice between providing a variable character word package or a few variable character words. Since many readers will have interests beyond the writing of arcade games, I will cover the former but with a view to reviewing pixel scrolls at a later date.

The loader listed here provides the facilities to perform horizontal scrolls and rolls. In part two, I will look at vertical movement. So what are scrolls and rolls. Well, both involve the movement of the contents of an area of screen. In the case of a scroll, the screen contents are lost as they scroll - to be replaced with new information. In this package, scrolling is incremental.

Consider a scroll in the left. The screen area is increased to the left, the internal column of characters is lost. The screen area is simultaneously replenished by a column of spaces on the right. In the case of a roll, the column of characters leaving the area is put on the other side of the area giving continuous motion of the screen - just like a conveyor belt.

Both scrolls and rolls have their value. A scroll is most useful for the presentation of a stream of information which is longer than the screen area involved. This could be a piece of language-man-avade game or a long piece of text. A roll is suited to the repetitive movement of a short piece of information.

The commands to control the scrolls and rolls have the simple form:

Where $SA_x = 48152$ for movement to the right and $SA_y = 48152$ for movement to the left.

It specifies the top line of the area moved. The top of the screen is line 0. It specifies the bottom line of the area moved. The bottom of the screen has a value of 24. The command moves the full width of the screen.

FLAG specifies the type of movement:

PLAG 1 = 0 if there is a small
PLAG 2 = 1 if there is a small

FLAG2 specifies the information received: bit 0 controls the character and bit 1 controls the colour.

PLACE = 1 moves the character only
 PLACE = 2 moves the column only
 PLACE = 3 moves both the column and character

MS specifies the number of characters moved each time the routine is called.

I mentioned earlier that scrolls place a space in the new column of the screen after moving the information. In the case of the colour scrolls, the colour in the new column is set to the current screen colour.

I have provided the option to move both colours and characters since it is possible to achieve some interesting effects. Try, for example, moving the colours and characters in opposite directions.

Two demonstration listings are provided to give an idea how the routines are used. I hope you find them of value.

Partnership: Gerald Anderson

[illegible]

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Brighten up your disk

directories with this

handy utility from

RJ Miller

RAINBOW



HAVE YOU EVER WISHED that you could make your disk directories look a little more interesting? Would you like them to give you a little more information? How they can.

Rainbow Disk allows you to split the disk directory into a number of different coloured sections.

Now you may have the games on your disk highlighted in red, your utilities could be green and you could have a blue section for data files.

Rainbow Disk is a Basic program and you should have no problems typing it in. However do make sure that you save it before attempting to RUN it.

Pretty Colours

Rainbow Disk is very easy to use. You should first design a section divider by following the on screen prompts, you can even put in your own messages. Then when this divider is stored on to disk all files that appear below it will appear in the new colour until a new divider is reached.

Rainbow Disk is an extremely good addition to the Disk Directory program by Ian Allan featured in the October 1985 issue of our Commodore. Simply append a range of coloured dividers to the end of the disk and then use Disk Directory to sort all of the files into the order that you require.

Program Details

10 - 40 set up variables
70 - 200 display instructions
260 - 360 choose a divider
370 - 400 choose a colour
410 - 490 confirm choice
500 - 610 save choice to disk
620 - 630 creating a divider
640 - 610 final options menu
620 - 660 display directory
640 - 660 get key information
680 - 760 read error channel

Variable Details

C - colour choice
D - divider choice
U - cursor
MA - match flag
AS - keyboard press
C64-4 - colour array
C65 - cursor down

CS - clear screen
CU - cursor up
DA(1-4) - divider array
DS(0-3) - disk error messages
FL - filename
MA - match string
MS - message on
WD - colour print
D - disk read

```

PROGRAM RAINBOW DISK
1000 *****
2000 *****
3000 *****
4000 *****
5000 *****
6000 *****
7000 *****
8000 *****
9000 *****
10000 *****
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92000 *****
93000 *****
94000 *****
95000 *****
96000 *****
97000 *****
98000 *****
99000 *****

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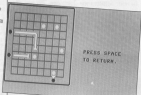
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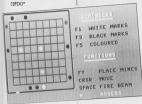
COPC17
1500 PRINT TAB(121) "DOWN,
BLACKBIRD DOWN RYDZ TP"
1510 PRINT TAB(121) "DOWN"
MOVE FORWARD TWO *
1520 PRINT TAB(121) "DOWN"
BRTS, COPC17
1530 PRINT TAB(123) "DOWN,
RAGNAROK APPROXIMATELY WHITE"
1540 PRINT TAB(123) "DOWN"
1550 PRINT TAB(121) "PLACE UP"
1560 PRINT TAB(121) "DOWN"
REVERSE BOARD, COPC17
1570 PRINT TAB(123) "DOWN,
COPC17"
1580 PRINT TAB(123) "DOWN,
BLACKBIRD APPROXIMATELY"
1590 PRINT TAB(121) "DOWN"
RETURN, COPC17
1600 GOTO 1600 PRINT "WHITE,
BLACK, DOWN"
1610 GOTO 1610 PRINT "BLACK,
DOWN"

```

[illegible][illegible][illegible]

```

1000 IF A(1)=1 THEN CONT
1010 IF A(2)=1, F=2 THEN THEN 3
1020 IF A(3)=1, F=3 THEN THEN 3
1030
1040 GOTO 1990
1050 IF A(4)=1, F=4 THEN THEN 390
1060 IF A(5)=1, F=5 THEN THEN 390
1070 IF A(6)=1, F=6 THEN THEN 390
1080 IF A(7)=1 THEN THEN 390
1090 IF A(8)=1, F=8 THEN THEN 390
1100 IF A(9)=1, F=9 THEN THEN 3
1110
1120 IF A(10)=1, F=10 THEN THEN 3
1130
1140 GOTO 2000
1150 IF A(11, F)=1 THEN THEN 2200
1160 IF A(12, F)=1 THEN THEN 2200
1170 IF A(13, F)=1 THEN THEN 2200
1180 IF A(14, F)=1 THEN THEN 2200
1190 IF A(15, F)=1 THEN THEN 2200
1200 IF A(16, F)=1 THEN THEN 2
1210
1220 IF A(17)=1 THEN THEN 2
1230
1240 GOTO 2000
1250 IF A(18, F)=1 THEN THEN 2200
1260 IF A(19, F)=1 THEN THEN 2200
1270 IF A(20, F)=1 THEN THEN 2200
1280 IF A(21, F)=1 THEN THEN 2200
1290 IF A(22, F)=1 THEN THEN 2
1300
1310 IF A(23)=1, F=23 THEN THEN 3
1320
1330 GOTO 2000
1340 IF A(24, F)=1 THEN THEN 2200
1350 IF A(25, F)=1 THEN THEN 2200
1360 IF A(26, F)=1 THEN THEN 2200
1370 IF A(27, F)=1 THEN THEN 2200
1380 IF A(28, F)=1 THEN THEN 2
1390
1400 IF A(29)=1, F=29 THEN THEN 3
1410
1420 GOTO 2000
1430 IF A(30, F)=1 THEN THEN 2200
1440 IF A(31, F)=1 THEN THEN 2200
1450 IF A(32, F)=1 THEN THEN 2200
1460 IF A(33, F)=1 THEN THEN 2200
1470 IF A(34, F)=1 THEN THEN 2
1480
1490 IF A(35)=1, F=35 THEN THEN 3
1500
1510 GOTO 2000
1520 IF A(36, F)=1 THEN THEN 2200
1530 IF A(37, F)=1 THEN THEN 2200
1540 IF A(38, F)=1 THEN THEN 2200
1550 IF A(39, F)=1 THEN THEN 2200
1560 IF A(40, F)=1 THEN THEN 2
1570
1580 IF A(41)=1, F=41 THEN THEN 3
1590
1600 GOTO 2000
1610 IF A(42, F)=1 THEN THEN 2200
1620 IF A(43, F)=1 THEN THEN 2200
1630 IF A(44, F)=1 THEN THEN 2200
1640 IF A(45, F)=1 THEN THEN 2200
1650 IF A(46, F)=1 THEN THEN 2
1660
1670 IF A(47)=1, F=47 THEN THEN 3
1680
1690 GOTO 2000
1700 IF A(48, F)=1 THEN THEN 2200
1710 IF A(49, F)=1 THEN THEN 2200
1720 IF A(50, F)=1 THEN THEN 2200
1730 IF A(51, F)=1 THEN THEN 2200
1740 IF A(52, F)=1 THEN THEN 2
1750
1760 IF A(53)=1, F=53 THEN THEN 3
1770
1780 GOTO 2000
1790 IF A(54, F)=1 THEN THEN 2200
1800 IF A(55, F)=1 THEN THEN 2200
1810 IF A(56, F)=1 THEN THEN 2200
1820 IF A(57, F)=1 THEN THEN 2200
1830 IF A(58, F)=1 THEN THEN 2
1840
1850 IF A(59)=1, F=59 THEN THEN 3
1860
1870 GOTO 2000
1880 IF A(60, F)=1 THEN THEN 2200
1890 IF A(61, F)=1 THEN THEN 2200
1900 IF A(62, F)=1 THEN THEN 2200
1910 IF A(63, F)=1 THEN THEN 2200
1920 IF A(64, F)=1 THEN THEN 2
1930
1940 IF A(65)=1, F=65 THEN THEN 3
1950
1960 GOTO 2000
1970 IF A(66, F)=1 THEN THEN 2200
1980 IF A(67, F)=1 THEN THEN 2200
1990 IF A(68, F)=1 THEN THEN 2200
2000 IF A(69, F)=1 THEN THEN 2200
2010 IF A(70, F)=1 THEN THEN 2
2020
2030 IF A(71)=1, F=71 THEN THEN 3
2040
2050 GOTO 2000
2060 IF A(72, F)=1 THEN THEN 2200
2070 IF A(73, F)=1 THEN THEN 2200
2080 IF A(74, F)=1 THEN THEN 2200
2090 IF A(75, F)=1 THEN THEN 2200
2100 IF A(76, F)=1 THEN THEN 2
2110
2120 IF A(77)=1, F=77 THEN THEN 3
2130
2140 GOTO 2000
2150 IF A(78, F)=1 THEN THEN 2200
2160 IF A(79, F)=1 THEN THEN 2200
2170 IF A(80, F)=1 THEN THEN 2200
2180 IF A(81, F)=1 THEN THEN 2200
2190 IF A(82, F)=1 THEN THEN 2
2200
2210 IF A(83)=1, F=83 THEN THEN 3
2220
2230 GOTO 2000
2240 IF A(84, F)=1 THEN THEN 2200
2250 IF A(85, F)=1 THEN THEN 2200
2260 IF A(86, F)=1 THEN THEN 2200
2270 IF A(87, F)=1 THEN THEN 2200
2280 IF A(88, F)=1 THEN THEN 2
2290
2300 IF A(89)=1, F=89 THEN THEN 3
2310
2320 GOTO 2000
2330 IF A(90, F)=1 THEN THEN 2200
2340 IF A(91, F)=1 THEN THEN 2200
2350 IF A(92, F)=1 THEN THEN 2200
2360 IF A(93, F)=1 THEN THEN 2200
2370 IF A(94, F)=1 THEN THEN 2
2380
2390 IF A(95)=1, F=95 THEN THEN 3
2400
2410 GOTO 2000
2420 IF A(96, F)=1 THEN THEN 2200
2430 IF A(97, F)=1 THEN THEN 2200
2440 IF A(98, F)=1 THEN THEN 2200
2450 IF A(99, F)=1 THEN THEN 2200
2460 IF A(100, F)=1 THEN THEN 2
2470
2480 IF A(101)=1, F=101 THEN THEN 3
2490
2500 GOTO 2000
2510 IF A(102, F)=1 THEN THEN 2200
2520 IF A(103, F)=1 THEN THEN 2200
2530 IF A(104, F)=1 THEN THEN 2200
2540 IF A(105, F)=1 THEN THEN 2200
2550 IF A(106, F)=1 THEN THEN 2
2560
2570 IF A(107)=1, F=107 THEN THEN 3
2580
2590 GOTO 2000
2600 IF A(108, F)=1 THEN THEN 2200
2610 IF A(109, F)=1 THEN THEN 2200
2620 IF A(110, F)=1 THEN THEN 2200
2630 IF A(111, F)=1 THEN THEN 2200
2640 IF A(112, F)=1 THEN THEN 2
2650
2660 IF A(113)=1, F=113 THEN THEN 3
2670
2680 GOTO 2000
2690 IF A(114, F)=1 THEN THEN 2200
2700 IF A(115, F)=1 THEN THEN 2200
2710 IF A(116, F)=1 THEN THEN 2200
2720 IF A(117, F)=1 THEN THEN 2200
2730 IF A(118, F)=1 THEN THEN 2
2740
2750 IF A(119)=1, F=119 THEN THEN 3
2760
2770 GOTO 2000
2780 IF A(120, F)=1 THEN THEN 2200
2790 IF A(121, F)=1 THEN THEN 2200
2800 IF A(122, F)=1 THEN THEN 2200
2810 IF A(123, F)=1 THEN THEN 2200
2820 IF A(124, F)=1 THEN THEN 2
2830
2840 IF A(125)=1, F=125 THEN THEN 3
2850
2860 GOTO 2000
2870 IF A(126, F)=1 THEN THEN 2200
2880 IF A(127, F)=1 THEN THEN 2200
2890 IF A(128, F)=1 THEN THEN 2200
2900 IF A(129, F)=1 THEN THEN 2200
2910 IF A(130, F)=1 THEN THEN 2
2920
2930 IF A(131)=1, F=131 THEN THEN 3
2940
2950 GOTO 2000
2960 IF A(132, F)=1 THEN THEN 2200
2970 IF A(133, F)=1 THEN THEN 2200
2980 IF A(134, F)=1 THEN THEN 2200
2990 IF A(135, F)=1 THEN THEN 2200
3000 IF A(136, F)=1 THEN THEN 2
3010
3020 IF A(137)=1, F=137 THEN THEN 3
3030
3040 GOTO 2000
3050 IF A(138, F)=1 THEN THEN 2200
3060 IF A(139, F)=1 THEN THEN 2200
3070 IF A(140, F)=1 THEN THEN 2200
3080 IF A(141, F)=1 THEN THEN 2200
3090 IF A(142, F)=1 THEN THEN 2
3100
3110 IF A(143)=1, F=143 THEN THEN 3
3120
3130 GOTO 2000
3140 IF A(144, F)=1 THEN THEN 2200
3150 IF A(145, F)=1 THEN THEN 2200
3160 IF A(146, F)=1 THEN THEN 2200
3170 IF A(147, F)=1 THEN THEN 2200
3180 IF A(148, F)=1 THEN THEN 2
3190
3200 IF A(149)=1, F=149 THEN THEN 3
3210
3220 GOTO 2000
3230 IF A(150, F)=1 THEN THEN 2200
3240 IF A(151, F)=1 THEN THEN 2200
3250 IF A(152, F)=1 THEN THEN 2200
3260 IF A(153, F)=1 THEN THEN 2200
3270 IF A(154, F)=1 THEN THEN 2
3280
3290 IF A(155)=1, F=155 THEN THEN 3
3300
3310 GOTO 2000
3320 IF A(156, F)=1 THEN THEN 2200
3330 IF A(157, F)=1 THEN THEN 2200
3340 IF A(158, F)=1 THEN THEN 2200
3350 IF A(159, F)=1 THEN THEN 2200
3360 IF A(160, F)=1 THEN THEN 2
3370
3380 IF A(161)=1, F=161 THEN THEN 3
3390
3400 GOTO 2000
3410 IF A(162, F)=1 THEN THEN 2200
3420 IF A(163, F)=1 THEN THEN 2200
3430 IF A(164, F)=1 THEN THEN 2200
3440 IF A(165, F)=1 THEN THEN 2200
3450 IF A(166, F)=1 THEN THEN 2
3460
3470 IF A(167)=1, F=167 THEN THEN 3
3480
3490 GOTO 2
```


[illegible][illegible][illegible][illegible]

```

0000 PRINT TAB(12) "DOWN,
SPECIES=PRINT TAB(22) "OUP,
SPECIESLEFT=PRINT
0010 PRINT TAB(12) "DOWN,
SPECIES=
0020 PRINT TAB(22) "DOWN,
FELLOW,SPECIESMATCH= "
0030 SET H=0:IF H=0 THEN GOTO 0040
0040 IF H=0 THEN GOTO 0050
0050 IF H=0 THEN GOTO 0060
0060 GOTO 0070
0070 FOR H=1 TO 100:
0080 IF H=1 THEN FOR H=1,1
0090 RETURN
0100 FOR H=1,1:FOR H=1,1
0110 RETURN
0120 FOR H=1,1:FOR H=1,1
0130 FOR H=1,1
0140 GOTO 0010
0150 GOTO 0010

```

[illegible]

Stuart Cooke opted out of

the rat race for a while to

look at the MS2000 mouse.

Documentation

The manual is adequate and the only problem is that a large amount of what I consider to be necessary information is missing.

How to load the software is covered in detail and there is a general description of how to use the mouse.

Most of the manual given over to an explanation of the graphics package, each available command is dealt with individually, each command being given a short but useful description.

What is missing from the manual is a detailed description of the mouse operation. No mention is made of how you can use the mouse in your own programs, how to detect the position of the mouse or check whether either of the two buttons are pressed. Surely this is a serious omission as many people will want to write their own programs that use the mouse.

Moving the cursor to an icon, a small picture, on the screen and pressing one of the buttons will cause a specific action to take place. For example moving the pointer to the magnifying glass will cause an area of the screen to be enlarged.

Software

As previously mentioned the software supplied with the mouse is a fairly comprehensive graphics package. The mouse is used not only to select options from the menus but also to draw on the high resolution screen.

In Use

The first thing that you notice about the package, when you come to use it, is a certain lack of 'professionalism'. Firstly, there is no turbo loader on the graphics package, though it is quite small and doesn't take too long to load. Secondly, the program does not auto run, you have to type 'MS-4004' after loading. It is a simple

matter to get a program to auto run thus making it easier to get going.

MS-4004 may be extremely easy to use to use but they do have their drawbacks. If like me, you only use the mouse on your desk once a year when you have a mouse fix, you'll soon run into problems. You need quite a bit of desk space to use the mouse.

Initially, the mouse is used to move a pointer on screen, every movement of the mouse being mimicked by the pointer. Therefore, to move the cursor you simply move the mouse across the desk, or in my case across the books, letters, tinseltins and coffee cups. No doubt you understand the problem.

The drawing package has three different menus. Because of lack of space on the screen, only one of these can be seen at any one time. To select the menus the pointer is simply moved to an icon that looks like a rabbit, pressing the button will then cause each menu to be displayed in turn. Yes, that's right a rabbit. Well the program is called CHEESE and is controlled by a mouse so why not have a rabbit? Oh, by the way, there is also an undo function in case you make any mistakes. Undo means the last thing done to the graphics screen. What I can't figure out is why this looks like a cat.

Because the program is so comprehensive it is probably worth mentioning each function in turn.

Main Menu

The main menu consists of three icons: The previous mentioned undo and menu select icons, and one to select the file pattern. Whenever you fill in an area on the screen it is filled with this pattern. There are 32 different file options ranging from a solid colour that look like building bricks. The inkjet icon and pencil icon are also always available. These are used to select the border and pen colour respectively. An icon that looks like a camera is used to change the background colour.

EVER SINCE COMPUTERS WERE invented people have been trying to find better ways of making them easier to use so that John Smith can sit down at the computer terminal and start work without too much instruction.

One day some bright spark invented the mouse, so called because it was a small box that connected to the computer by a long lead which looks rather like a mouse's tail. Apple used a mouse to its benefit when it launched the Macintosh computer. All software designed for this machine is under control of the mouse. No longer do you have to enter long instructions you simply have to select one of the pull down menus with the mouse and make the appropriate choice of command.

Now Wiggins Home has launched the MS2000 mouse so that Commodore owners can get a look at these exciting devices.

First Impressions

The MS2000 comes complete with an 'advanced graphics' program and a 16 page photocopied manual. The mouse itself is quite small and very well constructed. Examining the underside of the mouse reveals the rubber coated ball. It is this ball that moves when the mouse is dragged around your desk. The rubber coating gives good traction on most surfaces. The ball is easily removed by means of a sliding panel. Removal of the ball is essential from time to time for cleaning another moving around the desk the ball is bound to get covered in some rubbish.

Say Cheese

Now on to the other functions.

It is possible to draw straight lines with the straight line function. The mouse is moved to one end of the line, the button pressed, and the mouse again moved. The line then follows behind the mouse creating a straight line from its starting point. Forward continuous and dotted drawing are also provided. The thickness of the line that you draw can also be changed by the pencil icon.

It is possible to draw circles and rectangles and these can be either outline or filled. Remember, if you select fill, then the current tile pattern will be used. A picture of two different colours is used to select the palette. This allows you to change one colour on screen to another.

Not only is it possible to fill in circles and lines but it is possible to fill an irregular area on screen with the paint brush icon. Again this uses the tile patterns. Not only can you fill areas with a tile pattern but you can also use a space

can effect to fill an area with dots, the longer you leave the can over a specific area the more dots fill it, just like the area used to paint cars.

The actual drawing area that can be seen on the screen at any one time is smaller than the actual canvas. The scroll icon is used to move the canvas up and down so that you can work on the whole area.

Rectangular areas of the canvas can be copied. The size of the rectangle is left up to you. It is also possible to reverse rectangular areas on the screen. You can flip the rectangle either horizontally or vertically. A mirror function is also available. This will allow you to mirror whatever you do across horizontal, vertical and diagonal axis.

When finished you are able to save your pictures on to tape or get a printout on a Commodore compatible printer.

No provision is made to save the pictures to disk, though I am told that a cartridge version of the software will soon be available and will have a disk layout to it.

A Little Extra

A small section at the rear of the manual explains how you can make the mouse emulate a joystick by turning on the computer while a button is held down on the mouse. This will allow you to use the mouse with any software which uses a joystick. This is very handy, though I found it wasn't too good for playing games with and I did come across a small problem with this. When you connect on your C64 with the mouse attached, the mouse continuously sends its position to the C64. Because some of the joystick positions cause characters to be printed on screen you find that a continuous stream of spurious characters appear on screen making it impossible to type in anything on the keyboard, essentially if you want to load a game.

Verdict

Even though I have mentioned a couple of gripes about the M52000 it cannot be denied that it would make an excellent addition to any C64. The construction of the mouse is excellent and if you are into graphics then the package is very good. It's also great fun.

Touch Line

Name: M52000 mouse
Machines: C64/C128
Prices: £64.95 cassette, £66 version £3.50 extra.
Distributor: Wigmore, 12 Saville Row, London W1R 3AG (01-734 0571).



A TALE OF TWO TURBOS

Dave Crisp reviews two fast loader cartridges.

THAT IS THE NUMBER OF MINUTES I usually expect a program to load on a Commodore disk drive. Fortunately things have been getting better (slowly).

First came software turbo-loaders, such as Warp 5, and individual loaders produced by software houses for their own use. Now we are in the best stages of cartridge based turbo loaders.

Here, I have written about just two from the half-dozen good ones that are now available. One is comparatively low priced, the other relatively high priced but neither are simple turbo-loaders.

Both offer features which, I feel, make them good value for money and because of that a direct comparison would be unfair so they must be looked at as different solutions with only fast loading in common.

Limitations

One thing that I have not seen on any fast-loader is the ability to fast-load everything. This is in many cases due to confliction of memory, where the fast loader is RAM based, or due to the fact that some software uses its own load routines. In the early days of fast loading, any attempt to fast-load software such as day-script and Superbase resulted in the machine hanging up. But from what I have seen recently it would seem that most loaders now revert to normal loading if there is going to be problems. This prevents much plug-pulling and switch-switching in order to get going again.

The Final Cartridge

This is much more than a fast loader. It is a load kit, a printer interface, and a monitor. At first look it seems quite expensive but when you consider what the above would cost as individual items it really is a good buy.

On the top of the cartridge there is a switch and a button. The switch allows you to switch off the cartridge without having to remove it which does save considerable wear on the edge connector, and the button allows you to



Screen dump from doodle using the Final Cartridge

reset the kit for whatever reason you want. I have read that pressing "reset" and "Q" together results in even un-reusable programs starting. Very useful at times. I suspect that my manual was a pre-release manual as it could find no reference to this fact though I must say that, on the whole, the manual was still very good.

Function Keys

The Final Cartridge has been so well thought out that the 'new' operating system provides pre-defined three near-silent function keys. As soon as you plug in, pressing the function keys give you single key INT, RANDOM, RUN, OFF, DISK, DRIVE, CATALOG, and finally F8 gives you various disk routines

including format. You may think that having these keys pre-defined will interfere with anything that a program may try to do with the keys. That did occur to me but not until after I realised that I had already been using programs that defined the keys for their own use anyway, such as Micro-Dimples. With all the software I tried I had no problems whatsoever.

Toolkit

There are many different kinds of toolkits offering graphics aids, audio aids and so on. This one is simply a programmer's aid which helps speed up and simplify programming. Because of this you can save a finished program and run it on a machine without having to have the car-

tridge in place. Using tools which offer special commands can often cause problems, as running the program requires the presence of the tridge. Commands supported by the final cartridge are:

1. RUNNUMBER - including GO1126 and GO1185
2. APPEND - loads a second program on to the end of a program resident in RAM.
3. AUTO - automatically offers line numbers when writing a basic program. The start number and increment are entered in the form AUTO 10,10 and line numbers 10,10,10 and so on are added automatically.
4. HELP - when a program stops due to syntax error typing HELP will present the line numbers on screen and show you exactly where the problem occurred.
5. FIND - search through a program and displays the line numbers of any line containing the target word, e.g. FIND PRINT would display every line containing the command PRINT.
6. DEL - used in the same format as AUTO, DEL will delete any line numbers around those specified. Useful in conjunction with RUNNUMBER as it makes it easy to move sub-routines around.
7. OLD - if you have ever typed NEW and then realised you had forgotten to save your program simply type OLD and it reappears. Saves much hit-and-miss and computer hitting.
8. LIST - this is a simple listing command. Will list some programs that cannot otherwise be listed.

The rest of the toolkit commands are concerned with the Disk Operating system.

1. CATALOG - displays on screen the catalog of a disk without overwriting the program in memory. Should have been on the 64 to start with.
2. DISKFILE - TURBO-TAXI's program to disk.
3. DISCARD - single key stroke version of ERASE, i.e. Simple type DISCARD PROGRAM.
4. INTERPT - verify program written to disk.

Though not the most comprehensive toolkit does contain the most commonly used commands quite impressive.

Monitor

The monitor, built-in and addressed by pressing F2, is the same as the monitors found on the target computers. Here the manual is a little presumptuous and so if you are not familiar with a monitor a good book would help. Nice to have a good monitor immediately to hand.

Printer/ace

Used in conjunction with a Centronics type the final cartridge provides an excellent Centronics interface. And with a

good Epson-type printer many or less anything can be produced. Particularly nice is the screen dump facility.

Pressing RESET and the CONTROL key followed by a function key allows you to get a screen dump of a text or high resolution screen. The dump of the high resolution screen is faithful copy of whatever was on the screen, but it will not print out spaces. Using this I can now dump some of the graphics I have been unable to dump by any other means. Of course if you are doing a dump of commercial software it does remove the program from RAM and so you need to re-load to continue. But I can live with that.

Finally

I would buy the final cartridge just on the strength of its other facilities. Having a fast loader is a bonus. There are some titles that it will not turbo-load but on the whole it copes with most. At least it does not hang up if you try to turbo.

Using the final cartridge in conjunction with Turbo Simplex was super. Anybody who uses Simplex will know that waiting for it to load conversion functions is a little tedious. With the final Cartridge the main program loads in 12 seconds - Sub programs in about six. To conclude, the final Cartridge is by no means cheap. But imagine having a cartridge based fast loader, toolkit, printer interface and screen dump cartridge separately. I would be surprised if you had change from £80.

Touch Line

H and P Computers (TC) 3 Hordwaine Walk, Withers, Essex CM8 2SL
Tel 0276 571471
Price: £59

Tellogic GT Loader

The second cartridge (that the pleasure to use was the Tellogic Cartridge).

Certainly it does not have the range of facilities that the final cartridge can boast but it costs about £30 less.

This too has an on/off switch and one version also has a reset switch. This idea could well spread to more cartridges as the damage caused by edge connections by rough pushing in and pulling out of cartridge results in floppy results in floppy cartridges and thus constant hang-ups.

Essentially, Tellogic's cartridge is a fast loader. Speed increases are certainly very noticeable and about as fast as the final Cartridge. One nice touch is that any graphics which are supposed to be on screen, as the program loads, remain there - very reassuring. There is nothing more disconcerting than seeing in front of a blank screen when you know the order normal conditions you normally see flags,

markers, and stuff giving visual confirmation that at least something is going on.

Auto Switch Off

As it happens this cartridge also leaves the loading process alone if there are any problems and so loading events to normal, though I found most of the popular games loaded without any problems - even difficult multi-part games. I personally had no success with *Knight's Games* but I suspect that this was due to mis-alignment of my data heads rather than the cartridge. It may be worth pointing out here that if your drive is not in top physical condition, fast loaders tend to aggravate the problem. A drive in good condition should behave as minimal. If you are having little success with fast loaders or gradually start to find that programs will not verify or load then head alignment could be the problem.

Printing

A problem I did find when using the Tellogic cartridge along with a Commodore printer was that nothing happened. It would not even cough!

Tellogic acknowledges this and it is not exactly a fault, but if you are using a program which has its load from within the program and print out as well, you will need to switch the cartridge on and off between printing. Once you get used to it there is no problem, but it's rather a hassle.

I used this cartridge with Turbo Simplex and it performed well, loading times were much the same and I made using Simplex almost a pleasure. However, a program such as the accounts in its ability to print with the cartridge on.

Some disk commands are added with the cartridge and in most cases there is no need to suffix load commands with 'A. This is thoughtful and useful, and so the correct syntax for loading a program becomes LOAD*PROGRAM

If a directory of the disk is loaded the programs are shown with colors where needed and so, to load a program, you simply cursor down to the relevant program and type F8 (if shifted).

If you load the greater sign, <F8> - the error channel will be read and displayed, much better than open 15,15 and so on.

I liked this cartridge very much and if I had to buy one performance software than many that cost more and since it has been released it has dropped in price.

Touch Line

Tellogic, 29 Holme Lane, Blandford BH10 1QA
Price: £17 (£18 with reset switch)

SOFTWARE FOR

SALE

Save your fingers a lot of
work with our new software
service.

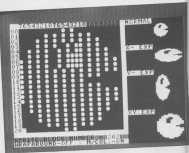
IT'S THREE O'CLOCK IN THE MORNING. You sit at the computer keyboard having just finished a marathon typing session entering one of the superb programs from Your Commodore. Your fingers reach for the keyboard and press the letters R, U and N. You sit back expectantly and...nothing happens.

Well, I'm sure that we have all had problems before now. When it does happen it's a matter of spending hours searching through the program for any typing mistakes. No matter how long you look or how many people help you, you can usually guarantee that at least one little bug slips through unnoticed.

Here, at Your Commodore, we pride ourselves on the quality of listing that we print. Unfortunately, this usually means that they are also very long, thus taking longer to type in and leaving more room for errors. All of the listings in Your Commodore are taken straight from a printed or working program. It is therefore very unusual for errors to appear in the magazine.

Because of the length of our programs we do get a large number of requests from readers who would like us to put specific programs on tape or disk for them. Obviously this is very time consuming and means that we can't spend as much time working on the magazine as we would like.

We are therefore proud to announce the start of the 'Your Commodore Software Service'. Most of the programs from each issue of the magazine will now be



available on a single cassette for a price of just 14.99. We will not be making disks available since they would have to be a lot more expensive and more difficult to post. This shouldn't cause you any problems though as none of the programs will be protected and it will be a simple matter to use the programs to disk yourselves.

All programs on the cassettes will be saved using a tape turbo routine.

However, we cannot guarantee that all programs will work correctly with this turbo routine present. We therefore recommend that before you use any of the programs you make a copy of the programs on your own cassette or disk and use this version of the program not the original.

This month we are not only going to make available most of the programs from this issue on cassette, we are also

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